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REPORT ON MARS, NO. 34.

By WILLIAM H. PICKERING.

The Apparition of 1924.

Opposition occurred on August 23, when the diameter of the planet was 25″.11, and the solar longitude ⊙ 242°.6, corresponding to M. D. November 25. It was slightly nearer to us on the previous day, but the difference in its diameter was less than 0″.01. The winter solstice, with the revised position of the polar axis based on our measures, which will appear shortly in the Harvard Annals, Vol. **82**, fell on September 24, Martian Date December 1. Since the southern hemisphere was turned towards us, it was therefore the summer season of the greater portion of the visible surface. At this apparition the planet approached nearer to the earth than had been the case at any time during the last century, and nearer than it will be again before 2000 A. D. For practical purposes, however, it comes as near to us once every sixteen years, or more accurately speaking at intervals sometimes of fifteen, and sometimes of seventeen years, when its diameter reaches 24″, or within 4 per cent of its diameter in 1924. Owing to its promised proximity, more interest was felt in the planet by the public, and perhaps as a result, we have a better set of drawings to select from this year, than at any previous apparition since the Society of the International Associated Observers of Mars was founded. Owing to the exigencies of publication it is possible to present in this Report only four series of drawings, but the others will appear a little later in the year. In another Report we shall also give the usual statistics of visibility of both the canals and lakes, as determined from the drawings of all the observers.

As in our Reports pertaining to the five previous apparitions, the drawings will be arranged in the order of the longitudes of the stations from which they were obtained. Since we have no European observers this year, the Jamaica drawings will be considered first. The designations, localities, and equipment of the various astronomers who reported are as follows:

P Professor W. H. Pickering, Mandeville, Jamaica, B.W.I. 11-inch refractor by Clark. Magnifications employed 300 and 430. Seeing on the Standard Scale ranging from 8 to 12.

H G. H. Hamilton, Esq. Same address, same instrument, magnification 300 and 430. Seeing on the Standard Scale 7 to 11.

W L. J. Wilson, Esq. Nashville, Tennessee. 11-inch reflector made

by himself. Magnifications 360 and 400. Seeing on the Standard Scale 8.

T Dr. R. J. Trumpler, Mt. Hamilton, California. 36-inch refractor by Clark. Magnifications 270 and 350. Seeing 2 to 4 on a scale of 5.

Description of the Drawings.

As in our former Reports, the drawings of the observers are so arranged that all in the same horizontal row shall represent approximately the same longitude on the planet. In the vertical columns the longitudes are intended to differ by just 60°, beginning with longitude 0°. Thus six views of the planet are shown by each observer, covering the whole visible surface. The six regions are indicated by the letters

TABLE I.

Fundamental Data of the Figures.

Fig.	Obs.	Apr.	Mag.	Sng.	1924	Reg.	Long.	ΔLong.	Lat.	Diam.	☉	M.D.
							°	°	°	″	°	
1	P	11	430	11	Aug. 28	**A**	358	— 2	—16	24.9	245.7	Nov. 29
2	H	11	340	11, 9	Sept. 2	**A**	1	+ 1	—16	24.4	249.0	Nov. 35
3	W	11	360	8	Aug. 30	**A**	2	+ 2	—16	24.8	247.0	Nov. 31
4	T	36	270	(3, 2)	Sept. 7	**A**	343	—17	—16	24.0	252.0	Nov. 39
5	P	11	430	10, 12	Aug. 22	**B**	60	0	—16	25.1	241.9	Nov. 24
6	H	11	430, 300	8, 10	Aug. 26	**B**	67	+ 7	—16	25.1	244.6	Nov. 28
7	W	11	360	8	Aug. 27	**B**	54	— 6	—16	25.0	245.1	Nov. 29
8	T	36	350	(4)	Aug. 29	**B**	69	+ 9	—16	24.9	246.4	Nov. 30
9	P	11	430, 330	10	Sept. 22	**C**	118	— 2	—17	21.4	261.5	Nov. 54
10	H	11	300	7, 8	Aug. 22	**C**	122	+ 2	—16	25.1	242.0	Nov. 24
11	W	11	360	8	Aug. 21	**C**	128	+ 8	—16	25.1	241.3	Nov. 23
12	(H)	11	430	7, 8	July 13	**C**	120	0	—18	19.8	216.9	Oct. 40
13	P	11	430, 300	11, 10	Aug. 12	**D**	178	— 2	—17	24.6	235.6	Nov. 14
14	H	11	430	7, 9	Sept. 19	**D**	181	+ 1	—17	21.9	259.7	Nov. 51
15	W	11	360	8	Aug. 13	**D**	175	— 5	—17	24.7	236.3	Nov. 15
16	T	36	270, 350	(3)	Sept. 21	**D**	207	+27	—17	21.6	260.9	Nov. 53
17	P	11	430, 300	8	Aug. 5	**E**	244	+ 4	—18	23.8	231.3	Nov. 7
18	H	11	430, 300	8	Aug. 7	**E**	240	0	—17	24.1	232.5	Nov. 9
19	W	11	360	8	Aug. 8	**E**	239	— 1	—17	24.2	233.0	Nov. 10
20	T	36	270	(2, 3)	Sept. 15	**E**	252	+12	—16	22.7	257.1	Nov. 47
21	P	11	430	12	Sept. 5	**F**	300	0	—16	24.2	250.8	Nov. 37
22	H	11	340	8, 10	Sept. 8	**F**	300	0	—16	23.8	252.8	Nov. 40
23	W	11	400	8	Aug. 2	**F**	304	+ 4	—17	23.4	229.2	Nov. 4
24	T	36	270, 350	(3)	Sept. 11	**F**	300	0	—16	23.4	254.6	Nov. 43

A, **B**, **C**, **D**, **E**, and **F**. In Table I is given a statement of the main facts relating to the various drawings. The Table is arranged as in previous Reports, the successive columns giving the number of the figure, the designation of the observer, the aperture of his instrument, the magnifications employed, the seeing on the Standard Scale, which is described in Report No. **9**, the date of the drawing, the region depicted, the longitude of the central meridian, its deviation from the desired standard, the latitude of the center of the disk, the angular diameter of the planet, the longitude of the sun as seen from Mars, as described in the Ephemeris, and the corresponding Martian Date, taken from Report No. **10**.

The average date of the drawings was August 26, or three days

after opposition. In 1914 the average date coincided with the opposition, in 1916 it was 5 days later, in 1918 it was later by 15 days, and in 1920 and 1922 by 19 days. Whether these changes are due to a difference in the personnel at the different apparitions, or to a difference in their enthusiasm, or to alterations in the declination and proximity of the planet, or finally to a difference in the planet itself is uncertain. It may be that after the oppositions of 1918, '20, and '22 the planet really showed more detail, and better drawings were secured than at the opposition itself, while the contrary was perhaps the case in 1914, '16, and '24.

Discussion of the Drawings.

What is very surprising in Dr. Trumpler's work is the low magnification which he used. A low magnification gives strong contrasts, but his eyesight must be very acute if he can see everything with it, especially the shapes of the smaller markings, as well as he could had he used a higher power. That he failed to see some rather obvious markings in the polar cap was probably due either to the fact that that region did not interest him, or that his eye was dazzled by the enormous light gathering power of the great telescope. He writes that he could not readily stop the aperture down to a smaller size, as has been found desirable by all other planetary observers who have had the opportunity to use large apertures. Had he been able to do so, however, to perhaps 20 inches, the writer is convinced not only that he would have seen even more canals and lakes than he did, but that they would have appeared to him of as small a size as some of them did to us here in Jamaica.

Unfortunately he made no drawing of region **C**, longitude 120°, but Mr. Hamilton, whose drawings most resemble his, has kindly contributed one of his own drawings made in July, which probably shows about the same canals that Dr. Trumpler would have shown had he made a drawing of this region. By this plan we are able to compare his work with that of the other observers. Dr. Trumpler has also forwarded a letter, which he wishes to have published, explaining his method of work. We are glad to do this, and would call particular attention to his statement that when he made the drawings, he was entirely unfamiliar with the map of the planet. This fact vastly enhances the value of his drawings, because on them he shows a number of well known narrow equatorial canals not recorded by any other observer at this apparition. This indicates not only the excellent seeing on Mt. Hamilton, but also the advantage that he possessed in detecting very delicate canals due to his larger aperture. Furthermore he shows several canals occurring in unexpected places, canals which seem entirely at variance with the general system of distribution which we have learned to expect to find upon that planet. Now it happens that these particular unusual canals were also recorded by Dr. Lowell in 1909, and drawn upon his globe, but never published by him.

Dr. Trumpler's letter is as follows:

COMMENT ON FIVE DRAWINGS OF MARS.

"Originally it was intended to make an effort at obtaining photographs of Mars with the 36-inch refractor of the Lick Observatory during the opposition of 1924. When the first experiments proved successful the scope of the program was enlarged so as to furnish material for drawing a detailed chart of the planet up to the northern latitude limit of this opposition. Between the time occupied with taking photographs the telescope was available for visual observations. In view of the fact that the telescope was assigned to the Mars work only part of the time, and that this time had to be divided between measures of the Satellites and physical observations, it was important to use the available periods of fair or good telescopic definition to best advantage. Since the positions of the principal surface markings, the outlines of the dark and light regions on Mars, as well as the different grades of shading, could in all cases easily be obtained from the photographs, it would have been unnecessary duplication to follow the usual procedure of making complete drawings at the telescope. The short time seemed better employed in devoting it entirely to the study of the more difficult details that were likely to be missing or incomplete on the photographs. Considerable time was often spent trying to catch a certain detail repeatedly at the moments of best definition, and most of the drawings made at the telescope are incomplete detail sketches.

"The five drawings, of which three have been previously published in *Publ. A. S. P.*, **36**, 263, were each made a few days after observation in order to try how the combination of photographic and visual observations would work. The outlines of the dark areas, the positions of the principal markings, and the relative intensities of the shadings were drawn according to enlarged positives of a set of photographs, while the details were drawn in from a sketch made on the same evening immediately before or after the photographs. Each drawing therefore represents essentially the features of one single sketch. It should further be stated that the sketches selected for the five drawings were the first made of this peculiar part of Mars. The observer had never before observed Mars in a large telescope and purposely did not study other persons' drawings in detail, so as to keep an entirely unbiased judgment. These sketches were therefore made as of a new and unknown configuration except for that part that was overlapping with one of the previous sketches. Under these circumstances it is well possible that some details may have been omitted which could have been seen if looked for.

"The main value of these drawings probably lies in the fact that they were made without any previous knowledge of the configuration, but they are probably far from showing everything visible in the 36-inch refractor under favorable circumstances. In fact the chart prepared from the complete material of photographic and visual observations during the five weeks' period following opposition gives a great deal more detail than any of these first drawings.

DATES OF THE PHOTOGRAPHS ON WHICH THE DRAWINGS ARE BASED.

		Gr. M. T.		
1924	Aug. 29.81	$\lambda =$ 69°	Sketch made	after photograph
	Sept. 7.79	343		after photograph
	Sept. 11.77	300		between two photographs
	Sept. 15.74	252		after photograph
	Sept. 21.76	207		after photograph

(On September 11 the mean of the two photographs was used for the drawing.)"

We shall be much interested to see his chart when it appears. It is of course a fact that everyone's complete set of drawings shows more canals than the six best ones of particular regions that they have selected for publication. This is due to various causes, chiefly to changes occurring upon the planet, causing some canals to appear, and others to disappear. These changes are due partly to the development of the vegetation itself, in part to local showers occurring at night and bringing out certain detail, and partly to clouds or haze. Thus certain canals may appear with a given central meridian ω, which are not visible either a little earlier or a little later in the same Martian day. Sometimes a canal is visible for only a few days during the whole apparition. As illustrating these statements it appears that, although using the same instrument, Hamilton's six drawings show a number of canals confirmed by others but not found on mine, and similarly my drawings show a number of confirmed canals not seen by him.

While it is probable that all observers see the more distinct canals very much alike, yet it is certain that in some cases they represent on paper what they see very differently. Perhaps the most striking case among prominent observers was that of Lowell, who had a marked tendency, probably on account of his adoption of the irrigation theory, to represent every canal that he saw, no matter what its width, by a fine straight line. Later he modified his sketches, especially by giving more curvature to those canals occurring near the limb, but he never got over making most of them straight, and of nearly the same width. A comparison of his work with that of the drawings made at this past apparition is very striking in this last respect. When well seen, the canals are of every degree of width, from the narrowest visible, up to over a second of arc at a near opposition. Another striking exception to the general rule of observers is Maggini, who dots his canals with innumerable lakes. This I understand is in deference to his theory that the canals are not in reality uniform lines, but consist of a series of irregular spots.

But even among observers conforming to the same general rules of representation, there are notable differences. Hamilton's early training was at the Lowell Obervatory. Whether it is due to that fact or not, and he thinks not, he in most of the six regions draws the canals distinctly narrower than the other observers. In regions **B**, **C**, and **F** I often agree with him, but in regions **D** and **E**, where the canals have always seemed to me wide, I agree better with Trumpler and Wilson.

This is especially true in the darker parts. Here I also agree with Douglass. In the lighter portions of these regions I see faintly shaded areas in place of the very narrow canals seen by the others. The boundaries of these shaded areas appear to coincide with their canals. This furnishes what is perhaps an interesting case of two Martian observers, each of considerable experience, using the same instrument, under similar conditions, and yet representing what they see of the more difficult detail quite differently. Of course the general features and the more marked canals are practically identical.

In those instances where a canal forms the boundary of a slightly darkened region, and Hamilton sees the canal sharply defined on both sides, while I do not, the drawing has a distinct bearing on the general question of the actuality of the duplication of the canals. It would seem to explain why he sometimes sees double canals, where I see only single ones. He sees four edges to the canals while I see only two. He shows two duplications in each of the regions **A**, **D**, and **F**, but in only one case this year are the components strictly parallel, and also in only one case, Pandora, is the duplication confirmed by another observer, Trumpler. While the writer has seen several wide duplications and several narrow ones at former apparitions, the wide ones he attributes generally to accidental arrangement, and as far as the narrow ones are concerned, he is not certain of their objective reality, although open to conviction by future results.

Aryn.

This marking has interested us on account of the importance attached to it by some of the earlier observers, and its visibility has been discussed in several of our earlier Reports. We have now been able to follow the planet through practically the whole of its year, and are thus able to note the effect of the progressive seasons upon this marking. When the planet's diameter is over 10″, so that it can be well seen, the region of Aryn always presents to me one of three very distinct appearances.

(*a*) The so-called two bays of the Furca are united into a single triangle of varying shape, Aryn itself being invisible.

(*b*) The two bays unite to form a quadrilateral, their northern side lying in a nearly east and west direction, but varying its azimuth slightly from time to time. Occasionally the northern side is very slightly concave towards the south.

(*c*) Aryn appears as a well marked shallow notch in the quadrilateral, or sometimes as a deep notch dividing it into two distinct triangular bays. This notch occasionally extends as far south as the latitude of the southern coasts of Edom and Thymiamata.

During November and December of 1913, after ☉ 344°.5, M. D. February 27, the triangular form (*a*) was continually presented. During 1914, '16, '18, and '20, until June 2, 1922, ☉ 167°.0, M. D. September 13, the quadrilateral form (*b*) prevailed, with occasional relapses in-

to the triangular shape (*a*). With the approach of the equinox, clouds drifting over from the north caused the northern side of the quadrilateral on the latter date to become faint and hazy, and a suspicion of notching was presented. This had entirely disappeared by M. D. September 44 and 45, but the next day, ⊙ 186°.1, a small but distinct notch was certainly seen. On M. D. September 48 this had again disappeared, the quadrilateral appearing as before, but September 49 at central meridian ω 330°.6 a shallow notch was distinctly visible. The diameter of the planet at this time was 19″.2 and the seeing 11, so that the conditions of observation were very favorable. Two hours later at ω 3°.0 the notch was marked and very deep, extending nearly to its maximum depth. The next day September 50 it had disappeared, and was still missing September 51 and 53, when on both dates the seeing was marked 11. After this we lost sight of it until the next presentation. As a shallow notch Aryn was then visible with one exception on every day of its visibility which occurred in our August. The following month, ⊙ 231°.8, M. D. November 8, it had vanished amidst the rush of cloud and vapor travelling back to the northern hemisphere. A month later this had overwhelmed the Furca also. The striking meteorological phenomena visible at this time will be described and illustrated in a future Report.

There is no question in my mind but that Aryn itself is simply a cloud formation of varying size, shape, and intensity, which after the autumnal equinox of the planet occupies a portion of the middle of the valley of the Furca. Occasionally it reaches well up to its center, but often merely occupies a portion of the northern end. Several Martian observers claim to have seen it faintly marked practically throughout the Martian year, but to my eye Aryn is either very conspicuous as a bright region against the dark background of the Furca, or else it is not visible at all. There is no half-way condition.

In April 1924, ⊙ 164°.8, I could see no trace of Aryn, but the next month, ⊙ 181°.1, M. D. September 38, a small but distinct notch had appeared. Hamilton confirmed this, but a few days later drew Furca with no notch visible. Aryn appeared to the best advantage in July and August, ⊙ 226°.9 to 300°.2, M. D. October 55 to November 37. In the later observations it had shifted well to the east of the central line of the valley, so that the preceding bay was but one-third the width of the following one. During this year it was well seen until ⊙ 291°.9, M. D. December 46, but after that as before, it disappeared in a darkened area of precipitated moisture. We thus have a difference in these two successive Martian years of eleven weeks in the disappearance of Aryn, and of seven weeks in the disappearance of Furca, thus indicating very clearly the extraordinary variability of the Martian weather.

A Curious Terminator Formation.

On the evening of October 20, 1924, an interesting cloud effect was noted on the terminator over Hellas. I had made an early drawing of

the planet at $11^h\ 52^m$ G.M.T., and had noted nothing peculiar about it, but at $12^h\ 18^m$, longitude of central meridian ω 209°.3, Hamilton came and reported a deep black notch in the terminator. An immediate examination showed not only a very conspicuous notch, but also a much less conspicuous projecting cloud immediately to the north of it (see

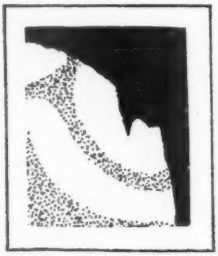

FIG. 25.
October 20, 1924.

Figure 25). The striking feature of the notch besides its depth, which was about 1″, diameter of the planet 16″.1, was its intense blackness, which I compared to that of the sky back of the planet, and Hamilton to the region beyond the terminator. It appeared to have received no sunlight whatever. Such a marking could only be a shadow, which we saw over the edge of the cloud casting it. As Hellas advanced onto the disk the notch gradually disappeared, as did the cloud following it soon after, but the curious feature was that the notch, while growing less deep, remained attached to the terminator. The phenomenon continued visible for two hours, corresponding to a rotation of the planet through 30°. Hellas extends from 275° to 310° of longitude. The notch began and ended approximately with the time that Hellas was crossing the terminator. It was also seen on the evening of October 21, when it was recorded as "very small," and on October 23, 24, and finally on October 27 at $15^h\ 27^m$, ω 189°.0. It was not visible on the nights of October 18, 19, 28, 29, or 30. The center of Hellas is in latitude 40°, longitude 292°, and its diameter, which is believed to vary, is about 1000 miles.

There can I believe be no question but that the projection on the terminator described by Dr. Van Biesbroeck in POPULAR ASTRONOMY, 1924, **32**, 589, is identical with the one described here. He saw it upon October 27, but not upon the next night. We made the same observation. He watched it until $16^h\ 50^m$. Our last record of it is $15^h\ 27^m$. This is natural, since the Yerkes Observatory is nearly an hour west of ours. Our drawings appear quite unlike, but the difference largely disappears on reading his description, in which he states that the space between the terminator and the cusp, which he represents in his drawing, perhaps quite naturally, as white, "appears as dark as the shadow side of the planet." He represents the notch as much less deep than as shown in my drawing, but my drawing, which agrees closely with

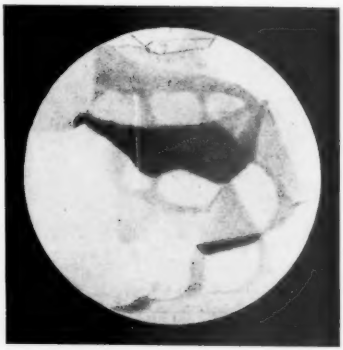

Fig. 13
Pickering 178° D

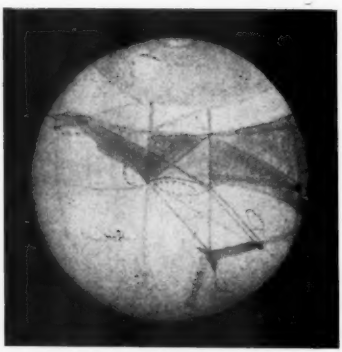

Fig. 14
Hamilton 181° D

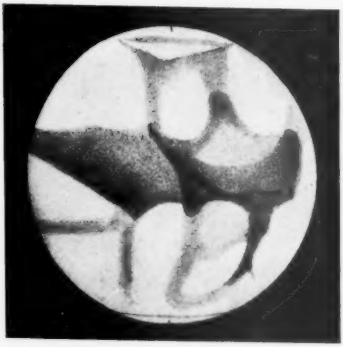

Fig. 17
Pickering 244° E

Fig. 18
Hamilton 240° E

Fig. 21
Pickering 300° F

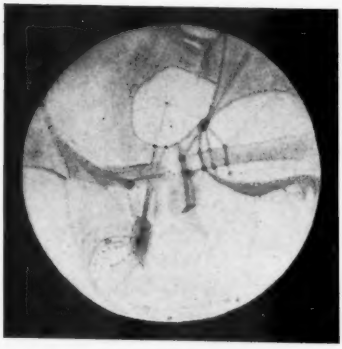

Fig. 22
Hamilton 300° F

DRAWINGS OF MARS IN 1924.

PLATE IV.

Fig. 15
Wilson 175° D

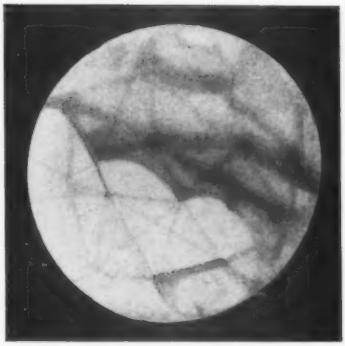

Fig. 16
Trumpler 207° D

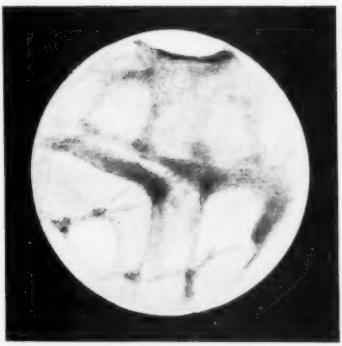

Fig. 19
Wilson 239° E

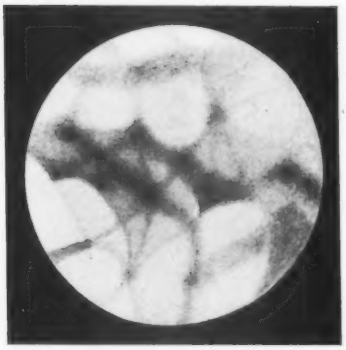

Fig. 20
Trumpler 252° E

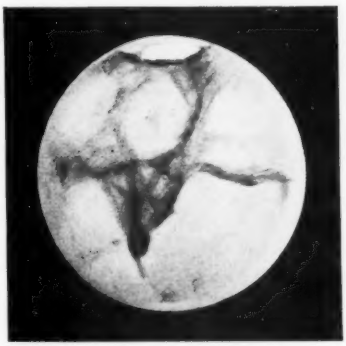

Fig. 23
Wilson 304° F

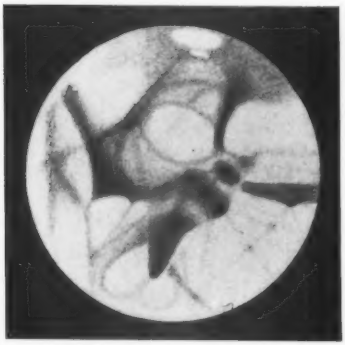

Fig. 24
Trumpler 300° F

DRAWINGS OF MARS IN 1924.

Hamilton's made at the same time, was made just a week earlier than his, and the notch became much more shallow as the days passed. Indeed on the last day of its visibility, Hamilton drew it of exactly the same depth as Van Biesbroeck, but much shorter.

The only marked difference between our observations lies in the latitude of the notch. According to Van Biesbroeck the latitude of the center on October 27 changed from —18° to —27°. We detected no change in latitude. Throughout the week of our observations its center remained constantly in latitude —40°. This we determined by measures made on October 20 and 27, both of which gave the same value, —40°.4. Our drawings upon the other nights gave obviously the same result. We also identified it at its beginning with the well known region of Hellas in which it started, and with whose central parallel it continued to coincide. This parallel lies in latitude —40°. The center of the notch is a little indefinite, and latitudes measured on the limb or terminator are less accurate than those measured on the central meridian, but we do not think we can be far wrong in our measures. The mean longitude of the crack on the terminator at our first view of it on October 20 was 287°, and at our last on October 27, 236°. In the mean time the middle of the cloud shadow had therefore shifted due east over Ausonia a distance of 51° of longitude, or 1400 miles. This is at the rate of 200 miles a day, or 8.5 miles per hour. The direction is what we should have expected in a temperate latitude, but the velocity is only one-third of what we usually find upon our planet. It should be mentioned that the solar longitude on the date of the first appearance of the shadow was 279°.0, corresponding to the Martian Date December 26. It must be recalled however that it occurred in the southern hemisphere of Mars, therefore it corresponded not to a winter, but to a summer storm.

The intense blackness of the notch, which struck all observers, we attribute to moistened ground in shadow, in other words to a continuous rainstorm, which was able to advance for some reason in these longitudes beyond the terminator, instead of being confined to the night side of the planet, as we have always believed and stated heretofore was the case. It is quite possible, however, that black markings such as this are not uncommon beneath terminator clouds, and that the peculiarity of this one consisted merely in the fact that the clouds over Hellas parted, and permitted the moistened unillumined area to be seen through a break in them. The length of the notch measured towards the central meridian on October 20, according both to Hamilton's drawings and mine was 13°.6 of longitude, or 380 miles. This curious shadow, and also its seven days' duration, we believe to be unique among observations of the planet, and we are very glad indeed to have Dr. Van Biesbroeck's confirmation of our work. As far as we are aware, the phenomenon was seen only in Jamaica and at the Yerkes Observatory.

Private Observatory, Mandeville, Jamaica, B.W.I.
January 13, 1926.

ON THE INTENSITIES OF THE LINES Ca+3934 AND Si++ 4553 IN STARS OF SPECTRAL TYPES O5—B3.

By OTTO STRUVE.

The frequent disagreement between the radial velocities obtained from the so-called stationary calcium line at λ 3934 and from other absorption lines has led to the belief that the calcium lines in stars of spectral type B3 and earlier do not originate in the atmospheres of the stars but are produced by vast clouds of calcium, surrounding them and ionized by some unknown sort of radiation. In a previous paper[1] various other facts were stated which support this belief.

Assuming the cloud hypothesis to be true, we would expect that the intensities of the observed stationary calcium lines would depend not only on the ionizing power of the stars but also upon the structure, the density and the thickness of the cloud of calcium. It seems probable that the ionizing power of a star depends chiefly upon its temperature. Therefore, there should exist an average increase of intensity in passing from the cooler to the hotter stars. This was shown in my previous paper to be the fact.[2]

However, it is extremely probable that the stationary calcium lines originating outside the stellar atmospheres and probably at enormous distances from them, are independent of such factors as are due to the structure of these atmospheres.

It is well known that early type stars of the same spectral subdivision may differ greatly in the general character of their lines. Adams and Joy[3] have suggested that this difference be defined by the letters s (sharp) and n (nebulous) added to the designation of spectral type. Shapley[4] has recently called attention to the fact that a new three-dimensional scheme of classification will soon be needed for stars of spectral type A, the third coördinate being defined by the width of the hydrogen lines.

The character of the lines (nebulous or sharp in extreme cases) probably depends upon the stellar atmospheres and is independent of the effective temperature. An inspection of various stars of spectral type B shows that the observed intensity of a stellar line depends to a large extent upon the character of the spectrum. The line is apparently stronger in stars designated as "s" and fainter in stars designated as "n". On the contrary, the stationary calcium line should, theoretically, be independent of the character of the spectrum.

In order to investigate this, I have utilized the intensities of the K lines collected in Table II of my previous paper.[5] The intensities were estimated on an arbitrary scale in such a way that the intensity of stationary K in 9 Camelopardalis which is nearly equal to that of the

stellar K line in α Lyrae, was called 10. Complete absence of K was designated by 0. The intensities obtained in this way are about 0.83 of those of Menzel.[6] They can be transformed into stellar magnitudes by means of the following table, in which $m—m_0$ designates the difference between the intensity of the continuous background and that of the line.

TABLE I.

Estimated Intensity	0	1	2	3	4	5	6	7	8	9	10	11	12	13
$m - m_0$	0.0	0.3	0.5	0.7	0.9	1.0	1.2	1.3	1.5	1.6	1.8	2.0	2.1	2.3

The table of intensities of the stationary lines contains 153 objects, all of which have spectral types not later than B3.

In order to compare the distribution of intensities of the stationary K line with that of an ordinary stellar absorption line, I selected the line of doubly ionized silicon at λ 4553. According to Miss Cecilia H. Payne[7] this line is first seen at B0. It reaches maximum intensity between B1 and B2 and is last seen in type B3. Thus it appears in practically the same stars that have stationary calcium lines, with the exception of class O, of which we have but few in our list.

I have recently estimated the intensity of λ 4553 in all stars of spectral types B0, B1, B2, and B3 of which there are spectrograms available at the Yerkes Observatory. The instrument was the same as that used for the investigation of the stationary K lines—the one-prism Bruce spectrograph. In all there were 160 stars, the estimated intensities ranging from 0 to 10 on the same scale as that used previously for the stationary calcium lines.

The character of the spectrum was defined by the estimates introduced by Professor E. B. Frost, in which every star is grouped according to its lines into one of six groups, designated as: "many-good"; "many-fair"; "many-poor"; "few-good"; "few-fair"; "few-poor." The first characteristic refers to the number of lines present; the second indicates the quality of the lines. Table II contains the distribution according to these groups of the 368 B-type stars, observed here for the determination of radial velocities.

TABLE II.

Magnitude / Character	0.0-0.9	1.0-1.9	2.0-2.9	3.0-3.9	4.0-4.4	4.5-4.9	5.0-5.4	5.5-6.0	Total
Many, good	1	1	5	7	14	10	3	4	45
Few, good	0	1	1	8	8	10	20	11	59
Many, fair	0	0	0	3	1	7	5	1	17
Few, fair	0	2	3	9	9	31	37	10	101
Many, poor	0	0	1	0	1	0	5	0	7
Few, poor	0	3	8	11	15	20	55	27	139
Total	1	7	18	38	48	78	125	53	368

An inspection of the table shows that there exists a positive correlation between magnitude and quality of spectrum. This relation, of

course, does not actually result from the stars themselves. Evidently the percentage of underexposed and defective spectrograms increases with the faintness of the stars, and this must manifest itself in an apparent correlation between magnitude and character of spectrum. It is not easy to determine the coefficient of correlation numerically, as it is difficult to introduce equal class-intervals in the columns. I have assumed that the groups as written in the table indicate equal class-intervals, which is of course arbitrary, and have computed the corresponding coefficient of correlation in the manner suggested by C. V. L. Charlier.[8] The result is:

$$r = +0.2 \quad \pm 0.05 \text{ (mean error)},$$

indicating the degree by which the estimated character of the spectrum is vitiated by outside factors, such as under-exposure, flexure of spectrograph, etc.

It is evident that this correlation will influence the estimated intensities not only of the stellar lines but also of the stationary lines. Thus we would expect to find a small coefficient of correlation between intensity and character for the K line and a much larger one for Si^{++} 4553, provided our explanation of the origin of stationary lines is correct. If the two lines were of the same origin, the coefficients of correlation should be equal.

Table III gives the mean intensities obtained separately for the two lines and grouped according to the character of the spectrum. Since it may seem objectionable to mix all spectral types from O to B3, I have given in the last line the results for spectral subdivision B1 separately. The number of objects contained in each group is given in brackets.

TABLE III.

	Si λ 4553			Ca λ 3934		
Character of Spectrum	good	fair	poor	good	fair	poor
Average Intensity (all types)	4.5(51)	2.3(54)	1.6(55)	3.5(51)	2.7(50)	2.3(51)
Average Intensity (Sp. B1)	7.4(9)	3.7(5)	1.8(4)	2.1(8)	2.0(3)	4.5(4)

Both lines tend to be fainter in the poorer spectra. This tendency is much stronger in the Si^{++} line than in Ca^{+}, which is in agreement with our hypothesis.

In order to compute the coefficients of correlation, I omitted for both lines those stars which were classified as "fair." It was thus possible to reduce the problem to the simple case of a twofold (dichotomous) classification. Assuming that the attributes A, a, B, b, indicate respectively: "good spectrum," "poor spectrum," "intensity more than 2," "intensity less than 3," it was possible to compute the coefficients of correlation according to Yule's formula:[9]

$$r = \frac{(AB)(ab) - (Ab)(aB)}{\sqrt{(A)(B)(a)(b)}}$$

This coefficient is zero if the attributes A and B are independent and it equals $+1$ if the correlation is complete. In our case I obtained for the Si^{++} line:

$$r = +0.47 \quad \text{(stellar)}$$

and for the stationary Ca^{+} line:

$$r = +0.29 \quad \text{(stationary)}$$

The first coefficient is nearly twice as large as the second. Evidently this second coefficient is fully accounted for by the relation derived above between magnitude and character of spectrum. The distribution of the intensities can therefore be regarded as an independent proof of the non-stellar origin of the stationary lines.

The frequency distribution of the intensities for both lines is given in Table IV.

TABLE IV.

Ca^{+} λ 3934.

Intensity / Sp. Type	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	Total
O	0	0	3	0	1	1	2	2	1	0	0	0	0	0	0	10
B0	0	4	4	3	1	1	0	0	0	0	1	0	0	0	0	14
B1	1	4	3	3	1	2	0	0	1	0	0	0	0	0	0	15
B2	2	6	0	4	3	1	3	1	0	0	0	0	0	1	0	21
B3	7	23	21	17	15	6	2	2	0	0	0	0	0	0	0	93
Total	10	37	31	27	21	11	7	5	2	0	1	0	0	1	0	153

Si^{++} λ 4553.

Intensity / Sp. Type	0	1	2	3	4	5	6	7	8	9	10	11	Total
B0	1	3	1	2	7	0	0	1	0	0	1	0	16
B1	0	3	1	1	3	3	1	1	2	1	2	0	18
B2	0	5	2	0	6	2	2	3	1	0	1	0	22
B3	13	42	23	11	8	3	1	2	1	0	0	0	104
Total	14	53	27	14	24	8	4	7	4	1	4	0	160

If every line in this table, except the two which give the totals, is regarded as a statistical series, the following characteristics are derived:

TABLE V.

Sp. Type	Ca^{+} λ 3934 Mean Intensity I	Ca^{+} λ 3934 Stand. Dev. σ	Si^{++} λ 4553 Mean Intensity I	Si^{++} λ 4553 Stand. Dev. σ
0	4.9	2.2	...	...
B0	2.9	2.5	3.5	2.4
B1	2.7	2.0	5.2	2.9
B2	3.4	2.8	4.0	2.5
B3	2.4	1.6	1.9	1.5

The unit is in every case the same as in Table IV. The mean intensities of the K line are essentially the same as derived in my previous paper.[10] The slight differences are due to some changes in the adopted spectral types. In general, there exists a small predominance of greater intensities in type O. The average intensities of the Si^{++}

line show that the maximum lies near B1, and that the intensity is decidedly greater for B0 than for B3.

The standard deviations of Karl Pearson (corresponding to the mean errors in the theory of probabilities) are considerable for both lines. Only a small portion of these can be due to errors in the estimates. In the majority of cases these errors do not exceed two units and it seems certain that they contribute less than one unit to the standard deviations in Table V. The remaining portions of these quantities must be due, in the case of the K line, to the various densities of the calcium clouds. For the Si^{++} line the large standard deviations are undoubtedly due to differences in the character of the spectrum. It is evident from the table that this source can change the observed intensity by more than three units, while for various spectral subdivisions the range in intensity varies only from 0 to 5. This result demonstrates the importance of using a third coördinate in the classification of spectra of early type.

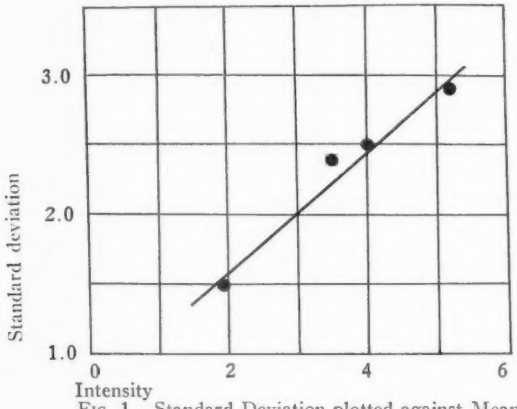

FIG. 1. Standard Deviation plotted against Mean Intensity of Si^{++} λ 4553.

The standard deviations obtained for the Si^{++} line at λ 4553 exhibit an unexpected relationship to the average intensity itself. The values of σ plotted against I, lie all in a straight line, as shown in Figure 1. Whether or not this relationship has a physical meaning cannot at present be ascertained.

The scantiness of the material does not permit investigation of the higher characteristics of the various series in Table IV. However, the last line for λ 3934, which gives the frequencies of different intensities of the stationary line for all spectral types, has some interest. The frequency curve, as shown in Figure 2, is moderately asymmetric. Its characteristics are:

Mean = 2.8 ±0.16 (mean error)
Standard deviation = 2.0 ±0.11
Skewness = 0.6

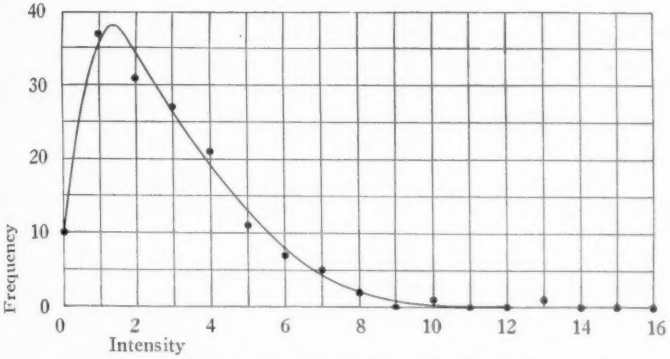

FIG. 2. Frequency curve of intensities for stationary K.

The skewness is expressed in Pearson's measure.[12] It equals zero for symmetrical curves and reaches 1 for strongly asymmetric series.

The type of the curve remains practically unchanged if we use in the abscissa, not the units of the intensity estimates, but the values of $(m—m_0)$ as given in Table I. However, if we use as abscissa the value log 10 $(m—m_0)$ we obtain a nearly symmetrical curve, as shown in

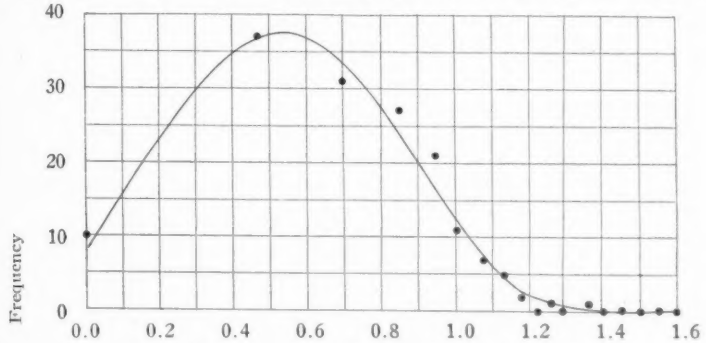

FIG. 3. Frequency curves of intensities for stationary K. Abscissae are log $10(m—m_0)$.

Figure 3. The abscissa of the first point on the diagram is uncertain, in view of the large class-interval.

This result is significant, as the values of $(m—m_0)$ are proportional to the thicknesses of the layers which contribute to the formation of a stationary line, provided that the density is constant.

In investigating the phenomenon of stationary lines it is important to know whether there exist any other phenomena due to the same cause. It is well known that in the case of Novae the stationary lines invariably occur simultaneously with various emission lines. In a formal way there exists a complete correlation between the appearance of

emission and of stationary Ca lines. It seems important to know whether this correlation extended to other stars. The number of bright line stars among those having stationary lines is small; in all, I counted only 17 such objects.[11] Table VI gives the distribution of these stars according to the intensity of the stationary Ca^+ line.

TABLE VI.

Intensity	0	1	2	3	4	5	6	7	8	9	10	11	12	13
Number of all stars	10	36	31	27	21	11	7	5	2	0	1	0	0	1
Number of Be stars	0	6	3	2	1	2	0	1	0	0	1	0	0	1

In order to compute the coefficient of correlation, I reduced the data to a twofold classification. If the attributes *A, a, B, b,* designate respectively: "intensity more than 2," "intensity less than 3," "presence of bright H lines," "absence of such lines," the coefficient of correlation is:

$$r = -0.01.$$

This quantity is entirely negligible. It must be assumed, therefore, that no correlation exists and that the simultaneous appearance of attributes *A* and *B* in all Novae is due to some additional attribute with which both *A* and *B* are correlated.

The average intensity of K for 136 stars not having bright lines is 2.8, while for the 17 stars in which emission is present it is 3.6. There is a slight excess in the case of the bright line stars, but in view of the previous result I am inclined to attribute this to chance. It is a strange coincidence, however, that the two stars having the strongest stationary K lines, namely χ^2 Orionis and 9 Camelopardalis, should at the same time have faint emission lines in Hβ. It is also strange that ν Geminorum, which has a stationary K line in spite of its late spectral type (B5), should also have bright lines. Nevertheless, there is no indication of a reality in this apparent relation.

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Yerkes Observatory, December 22, 1925.

REPORT OF THE AMERICAN METEOR SOCIETY FOR 1925.

By CHARLES P. OLIVIER.

In reviewing the work of the American Meteor Society for the past year it must be stated that while there is much to encourage us in many ways, one very serious fact must be faced. In the fifteen years of the Society's existence, a number of persons among its members have become skillful observers and for a period covering one to several years have sent in numerous observations, yet during 1925 nothing was received from our older and more experienced members except from R. M. Dole and the writer. No scientific organization can possibly flourish unless it can hold the interest of its members, particularly those who by ability and practice can best further its work. The writer has sought in vain to find means to induce the more experienced observers to again take up the work, but in general has failed. The reason is, of course, that most of these were young men, who, as their college work grew more intensive or after their graduation, were forced by lack of time to give up night work on meteors. And this followed especially as practically none of them entered astronomy as a profession.

The work of the A. M. S. is also different from that of the A. A. V. S. O. for example. In the latter organization a person can be sure to get results each and every night he works, and have something of value to contribute to astronomy. Observing meteors, however, is a gamble; one may observe several hours and see so few that he becomes utterly discouraged. It is only on selected nights of the year that meteors are seen in such numbers that one is kept constantly busy recording them. But on the other hand, meteors offer the chance of seeing something new and unexpected, perhaps a brilliant fireball, a long-enduring train, a serpentine path, or some other phenomenon of intense interest. Also the work undoubtedly trains an observer in quickness of judgment and accuracy in recording what is seen to an extent which practically no other branch of astronomy can equal for the same number of hours of training. But for the average amateur to observe a couple of nights and get almost no meteors is such a disappointment that he will never try again, or at least wait a long time before taking another chance. Those who have had experience also well know that, except on a few selected nights when showers are active, unless they observe from two to four hours continuously, and better after midnight, they will usually get nothing worth while. To a busy man the prospect of losing his sleep from midnight on is rather alarming when he has a day's work ahead.

But when all allowances are made it seems very strange that with the immense number of people in this country, men and women, who have much leisure time, many with no regular occupation or hours of

work, and yet are educated—to say nothing of busy people who have an intense enough love for science to make the necessary sacrifices of time and effort—it is impossible to find a dozen in the whole United States who will actually work a portion of one night per month on meteors! It must be that such persons do exist, if only we could come into touch with them. The writer has used all means at his disposal and most of the dozen remain undiscovered. In foreign countries such work has frequently appealed to army and navy officers, both active and retired, but in America such does not seem to be the case, though these would be particularly well equipped to undertake it. All of the above is written in the hope that readers will try to call to the attention of possible observers the needs and importance of meteoric astronomy, and how they can make a real contribution to science by taking an active part therein.

However, though dissatisfied that more persons have not taken an active part, the writer takes an equal pleasure in setting down the records of those who have. Table I contains the names of observers of naked-eye meteors, with the total number of nights on which they worked and the total numbers of meteors recorded. Table II contains the results for telescopic meteors, most of the observers being members of the A. A. V. S. O., the meteors having been casually noted during variable star observations.

TABLE I.

Observer	Station	Nights	Meteors
Bradley, F. T.	Crozet, Va.	2	87
Bunch, S.	Springtown, Texas	13	253*a*
Cramer, S. M.	Worcester, Mass.	38	602
Cilley-Morgan	Fort Spring, W. Va.	1	23
Dole, R. M.	E. Lansing, Mich.	37	768
Field, G. L.	Worcester, Mass.	15	134
McIntosh, R. A.	Hamilton, New Zealand	8	167
Olivier, C. P.	University, Va.	8	256
Thomsen, I. L.	Danneviske, New Zealand	1	19
U. S. Weather Bureau Hydrographic Office, U. S. N. Individuals			29*b*
Miscellaneous			7
Total			2322

a A timed count of 197 meteors by 3 assistants on Aug. 11 not included.
b Refers to bright meteors only. Newspaper clippings received from the Weather Bureau not included.

TABLE II.

Observer	Station	Telescopic Meteors
Bouton, T. C. H.	St. Petersburg, Fla.	14
Bunch, S.	Springtown, Texas	3
Chandler, F. H.	Belgrade Lakes, Maine	7
Chandra, R. G.	Jessore, India	6
Iedema, N.	Great Neck, N. Y.	1
Observers, McCormick Observatory	University, Va.	7
Peltier, L. C.	Delphos, Ohio	25
Waterfield, W. H.	Nakusp, B. C.	14
		77

As usual, L. C. Peltier leads in the numbers seen of these faint but interesting meteors. He writes that he saw many less in 1925 than in either 1923 or 1924 for the same number of hours of observing. For ordinary meteors two observers sent in large totals, S. M. Cramer and R. M. Dole. The former was largely instrumental in forming a society of young people interested in astronomy, in his home city, Worcester, Mass., several of whom are learning how to observe meteors. In fact, it is known as the Worcester Meteor Society. R. M. Dole, whose long record as an observer makes his work known to everyone, has as usual observed all the chief showers possible, besides making observations on other nights for the solution of certain very interesting problems. According to his observations the Lyrids, July Aquarids, Perseids and Geminids were fine in 1925, but the Orionids and Leonids poor. The writer can corroborate his remarks as to the Orionids, Leonids and Geminids. The good reports from R. A. McIntosh, who observes in New Zealand, are doubly valuable, coming as they do from the much-neglected Southern Hemisphere.

The most interesting thing to report from Virginia was an unexpected shower of bright meteors, over in 15 minutes, that began at 11 P. M., Nov. 20. It was seen by one of our new members, F. T. Bradley of Crozet, Va., a town about 12 miles west of Charlottesville, who counted 37 in 13 minutes; i. e., from 11:02 to 11:15 P. M. He then got out his charts and began to observe regularly at 11:25 but not another meteor appeared until midnight. Not being at first prepared, he was unable to determine the radiant, but he noted the general direction of all the meteors was from east to west, the radiant being below Orion. Two students on the University grounds counted 45 in 10 or 15 minutes, and described the radiant as being at altitude 30° to 40° azimuth about N. E., but this position was given from memory some weeks afterwards. They further stated that this was about 1 A. M. The writer, who was working in the dome with the 66 cm telescope that night, in going outside for a few moments saw 3 bright meteors about 11:05 P. M. The paths of two of these were mentally noted quite accurately, the path of the third being too poorly seen, though it was nearly parallel to that of the second. The radiant deduced from these two was $\alpha = 97°.5$, $\delta = +8°.5$. A parabolic orbit was then deduced, having first corrected the radiant for zenith attraction. This gave:

1925 Nov. 20.
$i = 75°$
$q = 0.13$
$\pi = 196$
$\Omega = 58$

Some of the elements fit those of Comet 1851 IV well, but the longitude of perihelion is hopelessly out. The meteors were of various colors, bright, slow, and left trains. Several other persons reported unusual numbers about 11 o'clock, but had not taken the trouble to count them. On the whole we have here a splendid example of a brief,

brilliant, and wholly unexpected meteor shower. If the two students were not off by 2 hours in their recollection, evidently a second group appeared after a quiescent interval.

Another matter of importance was the passage of three fine fireballs over New England in November and December, data upon which have been collected by Dr. W. J. Fisher of Harvard College Observatory, who is a member of the Meteor Committee. In all, several hundred reports were received by him relative to these bodies and it is hoped that orbits may be calculated for them all. He is also engaged upon an exhaustive study of the meteors photographed upon the unrivaled collection of plates at that observatory. Interesting and important results may be expected when his work appears in print.

The writer has begun the reduction of all the observations sent in by members of the A. M. S. for the years 1919-1925 inclusive. The reductions and publications may be finished before the year is out. Anyone who has records, not yet sent in, by mailing them within the next couple of months, can have them included in this résumé of these seven years' work. This offer holds equally for others, not members of the A. M. S., who have made meteor observations and have not yet published them. Due acknowledgement will be made to all contributors. About ten thousand observations are at present available. The form and treatment will more or less follow that of the two former ones which have appeared as Parts 4 and 7 respectively of Vol. II, Publications of the Leander McCormick Observatory. The observations of all telescopic meteors, now in our possession, will be fully treated in this coming publication.

At the Cambridge, England, meeting of the International Astronomical Union last summer the writer was appointed president of the Meteor Commission. He hopes to be able to use this as an opportunity for bringing about closer coöperation between various individuals and societies who are interested in meteoric astronomy, and in this way increase the general interest in the subject all over the world. His new book, "Meteors," published by Williams and Wilkins Co., Baltimore, Md., appeared during the year. This book was intended for both the professional and amateur worker, the writer trying to include within it answers to many questions that had often come up to him personally. Many of these answers have been quite out of reach of the average worker, being found only in publications very difficult to obtain. In the book the general history and theories of meteoric astronomy were of course treated at some length, and examples of computations of orbits and real heights were given.

Grateful acknowledgements are due to various members of the A. A. V. S. O. for observations of telescopic meteors; to the Chief of the U. S. Weather Bureau and the Commanding Officer of the Hydrographic Office, U. S. Navy, for sending copies of reports of bright meteors and fireballs received from ships' officers; and finally to individuals, too numerous to mention, for reports of occasional meteors.

In closing a cordial invitation is herewith extended to all interested in astronomy, and who feel that they would like to do some work on meteors, to write and ask for information about the A. M. S. And a further request is made of our inactive members, who number fully fifty, that they try to resume observations during 1926.

Leander McCormick Observatory,
University, Va., 1926 Jan. 25.

TIME BY SIRIUS.

By CHARLES CLAYTON WYLIE.

If one were selecting a single star, or constellation, for residents of the United States and Canada to use in reading the time from the night sky, the Dipper would probably be chosen as the most generally useful. It is circumpolar, and easily identified on clear nights. Simple rules for getting time from the position of the Dipper will be given in another paper. However, on some winter nights, the brilliant Sirius can be easily picked out in thin clouds when identification of anything in the northern sky is uncertain. At such times, the hour of night can easily be estimated from the position of this star, with the accuracy that the hour of day can be estimated from the position of the sun.

On New Year's eve the position of Sirius at any hour of night is that of the winter sun at the same hour of day. In the latitude of Iowa it rises about 7 o'clock, is on the meridian at 12 o'clock, and sets at 5 o'clock. One might say that on New Year's eve "Sirius time" agrees with local sun time. Since the stars gain two hours a month on the sun "Sirius time" will be two hours slow for each month before New Year's eve, or two hours fast for each month after.

From these considerations we have the following rules for reading the time from the position of Sirius.

1. Estimate the hour at which the sun is in the observed position of Sirius.

2. From this estimation, subtract double the number of months after New Year's day, or add to it double the number of months before New Year's day. The result is the local mean time. If the doubled number of months is larger than the estimated Sirius time, add 12 to the latter.

It is suggested that the position of Sirius be estimated to the nearest quarter hour, and that in the reductions the nearest quarter month be taken. The following examples will illustrate the method.

EXAMPLES.

1. A person waking up early on the morning of November 8 and looking out of a south window notices Sirius is in about the position of the 2 P. M. sun. What is the hour?

It is 1¾ months before New Year's day. Doubling and adding $1¾ \times 2 = 3½$; $3½ + 2 = 5½$. It is therefore 5:30 A. M.

2. On the night of February 22 Sirius is seen to be in the 2:30 position of the sun. What is the hour?

It is 1¾ months after New Year's day. Doubling $1¾ \times 2 = 3½$. The 2:30 must be increased by 12 before subtracting. $12 + 2½ = 14½$. $14½ - 3½ = 11$. It is 11 P. M.

University of Iowa, January 19, 1926.

THE DISTANCE OF THE STAR B. D. +30°3639 AND THE PROBABLE SIZE OF ITS ENVELOPE OF HYDROGEN.

By OLIVER J. LEE.

The unusual spectrum of this Wolf Rayet star was announced in 1890 by Mrs. Fleming, who remarked that "The spectrum of this star differs from that of other bright line stars, spectra of which have been obtained."[1]

W. W. Campbell concluded from his spectroscopic examination of the star that it is "surrounded by an extensive hydrogen envelope."[2] He also reported measuring the size of the hydrogen disk at Hβ and finding it to be about 5″ across. He examined the other 54 known Wolf Rayet stars about this time but failed to find any other such disk.[3]

Spectroscopic examination of this star by J. E. Keeler in 1898 led him to confirm Campbell's conclusion.[4]

Fom three spectrograms of this star secured at Lick in 1908 J. C. Duncan obtained the radial velocity of —30 km a second relative to the sun from the three hydrogen lines β, γ and δ.[5] About two-thirds of this velocity is due to solar motion.

E. E. Barnard in 1908 published notes on some incidental observations of 7 Wolf Rayet stars, including B. D. 30°3639, with the 40-inch telescope. He mentions that the best focus is 1.2 mm shorter than for an ordinary star and that it has "a strong glow about it."[6]

This star, with a few others of the Wolf Rayet type, was put on the Yerkes parallax program in 1919. So marked is the crimson ring around this star that I have regularly identified it for an exposure in the field of the 40-inch by its appearance rather than by the configuration of stars around it.

Sixteen plates, taken between September 1921 and September 1925, have been used for the determination of the parallax of this star. The result is,

$$+0''.001 \pm 0''.006.$$

The proper motion in X, obtained from this solution is negligible. We now have three unusually accordant modern values of the trigonometric parallax of this star.

Mount Wilson[7]	+″.005 ± ″.009
	.000 ± .001
Sproul[8]	—.002 ± .010
Yerkes	+.001 ± .006

If we take the average of van Maanen's two determinations, reduce all values to absolute by the additive quantities given in *Groningen Publications* 37, p. 3, and use for each the average of the probable errors given in one of the more recent lists of published parallaxes of each, we have

	Relative π	Correction to absolute	Absolute π	p. e.
Mount Wilson	+″.002	+″.001	+″.003	±″.0064
Sproul	—.002	+.003	+.001	.0100
Yerkes	+.001	+.003	+.004	.0085

and the mean

+″.003 ± ″.005.

This parallax corresponds to a distance of 1125 light years, and a diameter for the hydrogen atmosphere of this star equal to 28 times the distance across the solar system.

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5. Lick Observatory Bulletin, **6**, p. 59, 1910.
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Yerkes Observatory, Jan. 26, 1926.

PROMINENCES PHOTOGRAPHED WITH THE RUMFORD SPECTRO-HELIOGRAPH ON JANUARY 13, 14, AND 15, 1926.

By OLIVER J. LEE.

Due to a fortunate break in the weather on the above dates we were able to get a fairly satisfactory record of the sun's activity in prominences around the time of the recent total eclipse. It has been thought well to give some details concerning these eruptions for the convenience of the observers of this eclipse, who may be interested. Director Frost wishes me to say that the observatory will supply positive or negative prints from these plates on film or paper to those who can make use of them for comparison with eclipse photographs.

Most of these prominences are faintly recorded, due to the low altitude of the sun and the presence of a good deal of haze. In consequence they are not well suited for reproduction.

Σs9338 1926 Jan. 13.85 Greenwich Civil Time.

	P. A. NESW	Height in Arc	Description
A	20°	25″	thin column inclined 30° from normal
B	31-37	55	cone
C	56-72	35	crest and horizontal streamers
	Largest 66		
E	98	20	inclined jet
	108	15	several small remnants of streamer
	112	20	stubby prominence on 3° base

Σs9339 1926 Jan. 13.86 Greenwich Civil Time.

	184°	65″	streamers in strata on 2° base
G	293	30	very small
H	306		floating cloud 3° wide extending from 65″ to 130″
K	330-338	110	broken cone

Σs9342 Jan. 14.75

A	20°	25″	double knot
B	30-39	75	smoky pile
C	53	20	inclined spike
	58	20	radial spike
	61	20	on base 2°
D	87	15	very weak
E	115	20	small bunch
	129	20	small bunch
	144	15	inclined spike
	147	30	well formed arch of 3° base
	151	20	small knob

Σs9340 and 9343 Jan. 14.73.

	227°	55″	radial cyclonic twister with wide crest
F	233-238	30	active base and short streamer
G	288-292	40	structure on 3 short bases
H	309	15	faint inclined spike
K	331-336	85	conical structure

Σs9349 Jan. 15.71

A	15-19	30	double stub
B	32-38	100	has some structure
C	56-61	15	faint
D	85	30	hazy pillar
	83-88	65	arm extending from pillar
E	98-104	25	rather strong short streamers
	115	20	inclined spike
	148-151	35	rather strong pile

Σs9348 Jan. 15.71

F	225-241	60	group of willow tree structures
G	288	15	small and faint
K	329-334	95	rather strong, double base

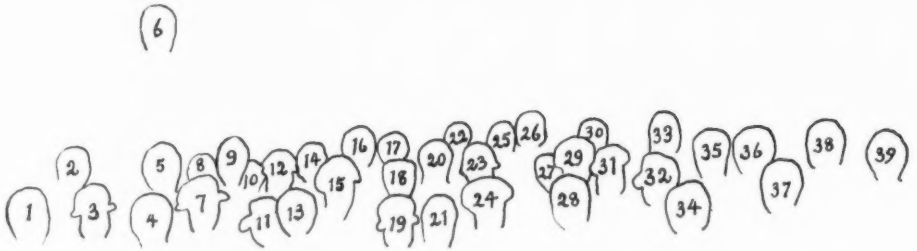
The letters in the first column refer both to prominences which persisted through the days in question and to centers of eruptive activity.

The heliographic positions of all spot groups on the visible hemisphere have been derived from plates taken with the 12-inch telescope (f = 18 feet) by Mr. Edward M. Justin on January 9 and 18, 1926. Reduction of these to the limbs of the sun shows only two possible

PLATE V.

THIRTY-FIFTH MEETING OF THE AMERICAN ASTRONOMICAL SOCIETY, ROCHESTER, DECEMBER, 1925.

Key to Plate V.



1. Stebbins
2. Jones
3. Miss Hill
4. Curtiss
5. Trivelli
6. Pawling
7. Miss Furness
8. Crawford
9. Green
10. Frederick
11. Miss Barney
12. Miss Harwood
13. Brown
14. Sandvik
15. Miss Fairfield
16. Shapley
17. Slocum
18. Bauer
19. Miss Hawes
20. Roe
21. Mees
22. Fecker
23. Miss Slocum
24. Mrs. Curtiss
25. Boothroyd
26. Poor
28. Comstock
29. Miss Young
31. Miss Bigelow
32. Miss Stillman
33. Cogshall
34. Leuschner
35. Silberstein
36. Stewart
37. Russell
38. L. R. Wylie
39. Stokley

cases of connection between prominences and sunspots. This is about what was expected.[1]

The small eruptions observed in position angles 108° and 112° on Jan. 13, at 115° on Jan. 14, and at 115° on Jan. 15, have about the same position on the sun as has a naked-eye group of sunspots observed at Lat. S 20° and Long. 73° on Dec. 28, 1925, and again in Lat. S 23°, Long. 66° on Jan. 18, 1926.

The group of willow tree structures observed in P. A. 225°-241° on Jan. 15, were located somewhat south of the complex group of spots observed in Lat. S 16°, Long. 260°, on Oct. 17, in Lat. S 15°, Long. 264°, on Nov. 17, 1925, and at Lat. S 17°, Long. 279° on Jan. 9, 1926. The direct connection in this case is doubtful.

Yerkes Observatory, Jan. 28, 1926.

THIRTY-FIFTH MEETING OF THE AMERICAN ASTRONOMICAL SOCIETY.

On the invitation of Director C. E. K. Mees, the thirty-fifth meeting of the Society was held at the Research Laboratory of the Eastman Kodak Company, at Rochester, New York, from December 31, 1925, to January 2, 1926. The headquarters were at the Hotel Seneca, where the members gathered on the first afternoon to start for an inspection of the plant of the Bausch & Lomb Optical Company. Although these works were not in operation, the members saw the Observatory on the roof of one of the buildings, and inspected several departments. In the evening there was a pleasant reception at the home of Dr. and Mrs. Mees.

On the second day, Friday, the morning session was largely devoted to papers on photography by the director and staff of the Research Laboratory, and it seemed a pity that all astronomical photographers were not present to benefit from these informative discussions by experts. Luncheon was served in the cafeteria by the Eastman Company as hosts. In the afternoon, the Society divided into separate parties for a thorough inspection of the work of the Laboratory, under the guidance of the different members of the staff. There were also shown some of the latest developments in colored motion pictures. In the evening we were guests at the Eastman Theatre, which represents the last word in motion-picture entertainment.

On Saturday, we got back to astronomical papers, including reports from the 1925 eclipse, and the eclipse motion-picture film exhibited by courtesy of the *Scientific American*. In the afternoon was read the retiring address of President Campbell. The meeting closed with a special dinner at the Hotel Seneca with President Comstock as master of ceremonies.

[1] Astrophysical Journal, **45**, 206, 1917.

The following new members were elected by the Council, making a total of four hundred and twenty-eight in the Society:

Hazel M. Burton, Mount Holyoke College, South Hadley, Mass.
J. A. A. M. Damen-Sterck, Casilla 1219, Santiago, Chile.
Paul Davidovich, Harvard College Observatory, Cambridge, Mass.
O. L. Dustheimer, 272 Beech Street, Berea, Ohio.
Ismael Gajardo Reyes, Observatorio National de Chile, Santiago, Chile.
Arthur M. Harding, Fayetteville, Arkansas.
J. Hartmann, Observatorio Astronomico, La Plata, Argentina.
Earle G. Linsley, Chabot Observatory, R. F. D. 1, Oakland, Calif.
Miguel Chaves Orosco, Astronomical Observatory, Tacubaya, Mexico.
Rosendo O. Sandoval, Astronomical Observatory, Tacubaya, Mexico.

Members of the Society present at the Rochester meeting were:

Ida Barney	A. Estelle Glancy	J. M. Poor
L. A. Bauer	C. C. Godfrey	E. D. Roe, Jr.
Harriet Bigelow	W. K. Green	H. N. Russell
S. L. Boothroyd	Margaret Harwood	H. Shapley
L. A. Brigham	M. Alberta Hawes	L. Silberstein
E. W. Brown	Laura E. Hill	F. Slocum
W. A. Cogshall	L. A. Jones	Lois T. Slocum
G. C. Comstock	A. O. Leuschner	J. Stebbins
R. H. Curtiss	E. G. Linsley	R. M. Stewart
Priscilla Fairfield	G. Lowell	J. Stokley
J. W. Fecker	C. E. K. Mees	L. R. Wylie
Caroline E. Furness	J. Pawling	Anne S. Young

It was announced that future meetings had been fixed by the Council as follows: 1926 September, at Nantucket, Massachusetts; 1926 December, at Philadelphia.

It was also announced, in connection with the next election of officers, that in addition to the official nominations there would be placed on the ballots any names proposed by ten members and sent to the secretary before May 1.

DO WE LIVE IN A SPIRAL NEBULA?

By W. W. Campbell.

(Address of the Retiring President, read at the meeting of the Society at Rochester, New York, January 2, 1926.)

In May, 1925, my colleague, Dr. Joseph H. Moore, and I determined anew the elements of the motion of the solar system, upon the basis of the radial velocities of 2034 stars, as observed at the Lick Observatory and at the Chile Station of the Lick Observatory. The apparent solar motion was found to be toward a point in the heavens having right ascension 268°.9 and declination +27°.2, with speed 19.0 km per second. These results are in good agreement with those obtained by me from 1193 observed radial velocities, in 1911, as follows: right ascension 268°.5, declination +25°.1, and speed 19.5 km per second.

The direction in which we found the solar system to be moving makes an angle of 22° with the plane of the Milky Way. Moving with a speed of 19 km per second, the solar system travels 600,000,000

km per year, or four times the mean distance of the earth from the sun. We are doubtless showing high respect for the values of understatement when we say that our sun is at least many hundreds of millions of years in age. Clearly our solar system in its early youth did not have its present position in the stellar system, and its old age will find it in still other surroundings. We cannot speak with confidence concerning the path upon which we are travelling, whether it is a great closed curve —an elongated ellipse, for example—which will suggest our return a few hundred millions of years hence to our present point of observation, or whether it is a path so curved that it does not return unto itself. If the stars were distributed in a system having spherical symmetry the center of the system should be the effective center of gravitational attraction and, neglecting minor perturbations, our sun should describe an ellipse about that center. But we know that our stellar system is not spherical either as to form, or as to the grouping of its component stars, and therefore the path followed by our sun probably differs somewhat from an ellipse. It is of interest to note that if our stellar system were spherical in form and the stellar materials were uniformly distributed through it, the revolution periods of the individual stars would all be equal, no matter what their distances from the center, no matter what their observed speeds at any instant, might be. A knowledge of the density of distribution of the star materials would at once tell us the common period of revolution. Eddington has calculated that a density of distribution which assigns ten stars, each equal in mass to our sun, to every sphere of space 33 light years in diameter would mean a period of 300,000,000 years for the sun and all other stars around the center of mass of the system. But, let us repeat, our system is not spherical in form, nor as to its stellar distribution, and we do not know the density of mass distribution even in our own neighborhood.

But at this point many questions suggest themselves. We are constrained to ask: May not our stellar system be one of those mysterious objects which we call spiral nebulae? Easton of Belgium considered this subject seriously, and rather favorably, a generation ago. The memorable discussion of the probable dimensions of our stellar system, conducted by Curtis and Shapley in 1920, under the auspices of the National Academy of Sciences, bore here and there upon this question, as well as upon the related question, Are the spiral nebulae island universes? Aside from the studies mentioned, the subject of our stellar system as a spiral nebula has received only haphazard attention.

The spectrum of a typical spiral nebula closely resembles the spectrum of our sun; as if the spirals were great collections of suns. Some of the spirals are from their spectra observed to contain true nebulae, just as our stellar system has many nebulae distributed within it.

The spirals closely resemble our stellar system in general outline. Their major dimensions are many times as great as their thicknesses, ten times as great in some observed cases. From the days of Herschel's star counts—star gauges, he called them—we have known that our

system is lenticular in form. Recent students of the subject incline strongly to the view that the ratio for our system is even much greater than 10 to 1.

Casual observation of spiral nebulae is sufficient to convince us that they are in rapid rotation—that is clearly the reason why they resemble lenses in form. The spectrograph has measured the rotational velocities of two or three spirals, with results about as might have been anticipated.[1] The observed rotational data, treated in accordance with the laws of celestial mechanics, tell us that these few spirals are each massive enough to supply materials for millions of stars equalling our sun in mass.

Hubble with the 100-inch reflector at Mount Wilson has recently resolved a few of the largest spirals into myriads of stars. He has shown that two of them—the two which have the largest angular diameters—are nearly a million light years[2] from us, and therefore that they have enormous linear dimensions. Expressed in light years their diameters are probably of the order of 40,000[2] in one case and 10,000 or 15,000 in the other.

When viewed edgewise, or nearly so, the spirals generally show the presence of absorbing or occulting matter on or near their peripheries. If we were near the center of one of the more or less irregular masses in one of the arms of a spiral, looking out through the supposedly starry heavens, might not the counts of stars show remarkable similarity to the star guages of Herschel? Shouldn't we expect to observe a Milky Way? Would not such a Milky Way be irregular in outline and intensity, and show cloud forms? Might not absorbing or occulting matter in a spiral, apparently an attribute of many of them, produce a bifurcated structure, similar to that of our Milky Way as seen in the night sky of the northern summer? Might not the central thicker nucleus of the spiral be actually invisible, save as to its two outermost segments, just as in the double section of our Milky Way we may be seeing merely the outermost segments of its thickest part? Or, it may be that an observer in one of the distant spirals, by virtue of prevailing obstructions in his line of sight, would not see the spiral nucleus at all, as we may possibly, though not probably, be prevented from seeing the nucleus of our system. Astronomers know that the appearance of our Milky Way, as to its outlines and densities, is profoundly influenced by obstructing material which interferes with our view of it. The apparent division of our Milky Way structure at its widest parts is thought to be due to the presence of invisible obstructing materials, in vast quantities.

Curtis's Crossley-Reflector photographs of several dozens of spirals

[1] Considerable doubt seems to have existed, and possibly still exists, as to the proper assignments of the spectrographically observed rotational speeds to the apparently nearer or to the apparently farther edges of the spirals concerned.

[2] These distances and dimensions do not differ greatly from those arrived at several years ago, by Curtis and others, from the observed magnitudes of the novae discovered in the spirals.

which are strongly inclined to the line of sight show what appear to be absorption or obstruction effects in essentially all cases. These effects in some spirals persist right up to the central nuclei: the halves of a few such nebulae, thought to be the halves nearest to us, are reduced in brightness, as if a considerable share of the radiations which would otherwise have come to us from those hemispheres were cut off by obstructing materials. If such an obstructing system, perhaps preferably an occulting system, prevails on and near the periphery of our stellar system, an occulting structure of considerable thickness existing not only in the plane of the Milky Way but extending out at right angles to it considerably farther than the radiating stars extend—as seems to be the case in some of the oblique spirals referred to—then we should not be able to see faint objects, such as spiral nebulae, in the direction of the Milky Way, or on or near its borders. Now this is exactly in accord with the facts of observation. With the Crossley Reflector, Keeler showed that there are certainly many tens of thousands of nebulae in the heavens which have the general form of spiral nebulae. Though Hubble's photographs with the 100-inch reflector of Mount Wilson have failed to show spiral structure in many of these nebulae, their spectra seem to resemble closely the spectra of spirals. They are extremely plentiful in a large region of the sky which contains the north pole of the Milky Way, that is, in the region farthest from the Milky Way, and they are plentiful in a very large region surrounding the south pole of the Milky Way; but as the sky areas photographed are closer and closer to the Milky Way, the numbers of spiral nebulae recorded grow smaller and smaller, and before the Milky Way structure is reached the spirals cease to show at all. In the direction of the Milky Way background, which covers a pretty large area of the sky, not a single spiral nebula has ever been observed.

Shapley's studies of the distances of many globular star clusters in the Milky Way, which are prevailingly close to its central plane and may therefore be assumed to be component parts of our stellar system, have led him to the conclusion that even if the most distant clusters are on the actual periphery of the system the radius of our stellar system must be of the order of 150,000 light years.[3] The presumably nearest spiral nebulae are nearly a million light years away, and we have no apparent means of telling how far away are the ones with angular diameters so small that they are difficult to distinguish from single stars. Perhaps it is too much to expect that the greatest of the spirals should be our nearest neighbors; at any rate it is not difficult to imagine that some of the more distant spirals have linear diameters equalling or exceeding the diameter of our stellar system. Recalling, from the theo-

[3] It is an interesting fact that whereas Shapley viewed with disfavor the island-universe interpretation of spiral nebulae, and Curtis was unable to accept Shapley's dimensions of our stellar system, Miss Leavitt's formula for the period-luminosity relationships in Cepheid variable stars, after modification of its constants by Shapley, was used by Hubble to establish the island-universe dimensions of the spiral nebulae.

logical history of the world, that man always started out with the idea that his abode was the center of the universe, and later became more humble, it would be surprising if our stellar system should prove to be unique either in kind or in size. It would be astonishing indeed if our thin and flat stellar system had tens of thousands of spiral attendants to the right of it, and tens of thousands of spiral attendants to the left of it but none in front of it, none in or near any extension of its principal plane.

The motions of the spirals seem also to free them from the charge that they are retainers of our stellar system. Slipher has found them to have uniquely high radial velocities; from 300 km per sec approach up to 1800 km per sec recession, for 43 observed nebulae not in our stellar system; 24 of them showing detailed spiral structure and the remaining 19 the general forms of spiral nebulae. Although other conditions than the radial velocity of the light source as a whole are known to displace spectral lines from their normal positions, there seems now to be no inclination to doubt that the large displacements observed by Slipher are chiefly and perhaps wholly Doppler-Fizeau effects.

Following the methods employed for determining the motions of the solar system from radial velocity data for the surrounding stars, Lundmark has determined the motion of the solar system with reference to the 43 spirals as a system. He obtained a velocity of 401 km per sec. Naturally the solution, depending upon very limited data, is of limited weight, but accepting the solution at its face value it says that with reference to the 43 spiral nebulae, considered as a system at rest, the sun and its group of neighboring stars comprising our naked-eye system, and perhaps representing fairly well our entire stellar system, is travelling with a speed of about 400 km per sec—a speed of the same order of magnitude as the radial velocities possessed by many of the 43 spiral objects themselves. Even as to its speed our stellar system appears to conform to the spiral type. Should it appear in the sequel that the extremely distant spirals have actual radial velocities lower than those observed, because a curvature of space, conforming to the Einstein theory of relativity, would have the effect of adding to their apparent velocities of recession, the percentage of change required in the dimensions I have quoted should be low.

Referring to dynamical conditions within the spirals: why have they developed into their present state, and how do they maintain their strange forms in the face of strong central gravitational attraction? The comprehensive answer is, they are in rapid rotation. Jeans and others, making profound studies of these objects, have come to this conclusion. In fact, as noted above, one has but to look at the photographs of the brighter and larger spirals, including those viewed obliquely as well as those seen edgewise and in full face, to obtain the conviction that this is so. The measures by van Maanen have appeared to show rapid motion outward along the spiral branches for the matter com-

posing the branches. These van Maanen components of motion apparently include such other components as arise from the relatively rapid revolution of the several measured points around the centers of the spirals. But as my purpose is not to discuss the mechanics and dynamics of spirals, except in a most general and limited way, I do not attempt to interpret the measures made by van Maanen, in the light of apparently conflicting results obtained by Curtis, Ritchey, Lundmark, Hubble and others. My question is, assuming the composition of the spirals to be chiefly stellar, with each nuclear mass a group of stars widely separated, in what orbits do the individual stars move? Is it not possible that the stars in any one great group are not totally free to depart from their group, and are not free to describe elongated elliptic orbits around the center of mass of the spiral, except as fortuitous perturbations may free a star now and then from the serious and perhaps commanding influence of its group? The general form of orbit described by a star at a great distance from the center may resemble a circle, in response to the rotation of the entire spiral body; but it would be surprising if a great number of stars composing one of the nuclei in a spiral arm should not develop their own system of motions, in reponse to the conditions of equilibrium. If the principal dimensions of a spiral are a few tens of thousands of light years, the thickness of some of its more or less isolated masses may be several thousand light years, and the stars composing such a mass may well have their local system of orbital motions, very much as Jupiter and his three outermost moons have their local system of motions, though subject to large perturbations from the differential attractions of the sun, while revolving around the sun.

But to come back to our own system: How has it happened that our system, so enormous in its Milky Way dimensions, is relatively so thin and so flat? It is at least as thin, relatively, as any spiral thus far observed in an edgewise position. Must it not have developed with the accompaniment of high rotational speed? Or if formed, and in the absence of rotation, could its stellar cloud forms have avoided dissolving or collapsing? Answers in favor of a rotation of the system, now and throughout the history of its development, seem to me natural, and reasonable, and I am tempted to say necessary. We all incline to the opinion that the developments of the individual stars have covered several thousands of millions of years. For the Milky Way structure to form, to endure through long ages, and to present no recognizable signs of collapsing, it must be in a state of equilibrium; and equilibrium in such matters, to the best of our knowledge, means a rotation of the system around an axis through the effective center of mass of the system. For a system so vast as to its distances, and with so low a distribution of materials throughout its extent, an extremely slow speed of rotation would be called for: Poincare has estimated that an angular speed of a few tenths of a second of arc per century would suffice to maintain equlibrium. The observed proper motions of the stars have

been utilized by half a dozen astronomers in efforts to uncover the first indications of a rotational effect. Out of eleven such results, six indicated rotation of the stellar system toward the east and five rotation toward the west, all being at exceedingly slow rates. We may therefore say that the evidence presented by them is negligible. Charlier has found that the line of intersection of the invariable plane of the solar system with the central plane of the Milky Way is apparently shifting easterly amongst the stars by 0.35 second of arc per century. A literal interpretation of this result favors a rotation of the Milky Way system westerly at the slow rate quoted. The subject is an extremely difficult one and the discovery is for the future to make.

We do not know, I must confess, that our stellar system is now a spiral nebula, or that it is the developed product of a spiral of ages past, but it does seem to have most of the known attributes of a spiral. The motions of our naked eye stars are in such directions and of such speeds in general that their velocity components in the plane of the Milky Way are larger than their components at right angles to that plane, as perhaps we should expect, but the latter components are relatively much larger than we should expect, or have succeeded in explaining, on the supposition that we are dealing with motions in orbits which have the effective center of the great stellar system in or near their foci. There are many other perplexing facts brought to light when we attempt to determine the elements of the solar motion with reference to groups of stars having different spectral classes, or very different absolute magnitudes, or velocities of very different orders of magnitude. It is quite possible that the wide variety of results for the motion of the solar system with reference to the different groups of stars mentioned, as obtained by Strömberg and others, and likewise the fact that the velocity components at right angles to the plane of the Milky Way seem unduly large, will find easier explanation if the observed stellar velocities are in some degree local effects. Our sun and our naked eye stars and our neighboring stars in general to the number of many millions may compose a veritable star cloud, with resemblances to those observed in our great Milky Way structure, and possibly such as the more or less isolated masses of stars which apparently go to make up a typical spiral nebula. We do not actually know that the density of distribution of stars in our region of the stellar system is less than it is in some of the distant Milky Way cloud forms. If our sun and our neighboring stars are members of a rich local group of stars the mass of the group as a whole may be sufficient to account for an appreciable component of the motions which we have observed; but I must confess that this is carrying the speculative spirit very far indeed. Fortunately such speculations need do no harm, and they have been known to do good.

I have speculated concerning our stellar system as a spiral nebula, partly as a guard against the assigning of undue weight to the deduced motion of our solar system. The speed and direction of the sun's mo-

tion, as here determined, may or may not hold good for the stellar system as a whole. If our local group of stars to which the solution refers composes but a small part of one of the isolated masses in a typical spiral, a knowledge of our motion with reference to the observed group of 2034 stars may not tell us much concerning our motion with reference to the spiral as a whole. And if our stellar system is not a spiral, but on the contrary a non-rotating, fairly symmetrical system, we should likewise be modest in drawing conclusions as to where our tour amongst the stars is going to carry us, and when we may expect to return. Shapley may be approximately correct in his estimate of 300,000 light years for the diameter of our system, and there may be merit in his surmise that our present place of abode and travel is in a locality situated about 60,000 light years from the center of the system, which center, he suggests, is in the rich Milky Way region of Sagittarius. Now the 2034 naked-eye stars upon which our solution for the solar motion depends are nearly all within a sphere of radius 500 light years having our sun at its center, and certainly there were no stars used in the solution which are as much as 1000 light years away. If we represent the stellar system in its greatest dimensions by a circle, assuming that its radius is 150,000 light years, and if at some point about two-fifths of the way from the center to the circumference we draw a circle with radius 1000 light years, we shall find that this latter circle is little more than a dot upon the picture. If we represent the stellar system by a circle 300 inches, or 25 feet, in diameter, a circle within it only 2 inches in diameter would in effect contain the 2034 naked-eye stars used in our solution, and the overwhelming majority of these stars would lie within the central 1 inch[4] of the 2-inch circle.

We know to a degree of accuracy quite satisfactory our sun's motion with respect to a system of 2034 stars, nearly all giant stars, in our own neighborhood. The elements of the sun's motion as here determined may be, and probably will prove to be, also quite satisfactory with reference to a vastly greater group of stars. That remains to be determined. We can report progress and feel assured that future astronomers, equipped with more powerful instruments and probably with more effective methods, will carry on with stars continually fainter and more distant. It is by the taking of such successive steps that great problems of this kind eventually reach their solution.

[4] Assuming, with Eddington, a density of 10 stars, each equal to our sun in mass, per sphere of diameter 33 light years, a sphere 1000 light years in diameter would correspondingly contain 270,000 unit stars. A circular disk of space 300,000 light years in diameter and 10,000 light years thick, would similarly contain more than 300,000,000,000 unit stars! We do not seem to be in possession of any facts of observation suggesting that our most powerful telescopes, employed in the manner which enabled them to photograph the most distant star clusters used by Shapley in estimating the diameter of our stellar system, would record more than 3,000,000,000 stars in the system. Are there really good reasons for thinking that the star clouds, or the stars distributed with the same order of frequency as observed in the sun's neighborhood, extend out even to half the distance of the farthest globular clusters thus far observed?

ABSTRACTS OF PAPERS

ERRORS OF WAVE-LENGTH IN STELLAR SPECTRA ARISING FROM THE TITANIUM COMPARISON SPECTRUM.

By Sebastian Albrecht.

The great bulk of the work on stellar radial velocities and wave-lengths has been carried on with the use of Rowland's system of wave-lengths. A change to the international system is very desirable but will not be entirely satisfactory until additional laboratory and solar wave-lengths shall have become available. In the meantime I have endeavored to discover and eliminate various sources of error in stellar wave-lengths which are based on the Rowland system. The present note discusses certain errors which arise from the use of Rowland's wave-lengths for the titanium comparison spectrum.

Laboratory wave-lengths should, of course, be employed for the comparison spectra. Rowland's wave-lengths, which have commonly been employed, are solar wave-lengths and are therefore not in every instance due to titanium alone. In order to discover which of the comparison lines are appreciably affected by companions in the solar spectrum due to other elements, a comparison was made with Crew's recently determined titanium wave-lengths. When the differences Rowland minus Crew are plotted and a smooth curve is drawn best to represent the plotted points, three lines stand out as widely discordant, the remaining points deviating from the curve only moderately. The following marked changes in the comparison wave-lengths seem clearly indicated: 4367.823 instead of .839; 4387.023 instead of .007; and 4590.142 instead of .126.

These errors affect the mean radial velocity only slightly, but they enter individually with nearly their full value into the wave-lengths of stellar lines which are near these positions. The effect is well illustrated by the helium line 4388.1 in Class B stars. The new wave-length of 4388.104 based on the comparison wave-length of 4387.023 is a distinct improvement over the old value of .092, in its better agreement with both the laboratory value of .100 and the stellar wave-length of .112 which was obtained from measures for which the comparison lines 4395 and 4399 were employed. In fact, the actual agreement is still better than is indicated by these figures, because further analysis shows that the value .112 would be reduced if we were to omit the measures which are based on the line 4395, which is usually too broad on the spectrograms.

CONCERNING PROPOSAL OF CONCOMITANT SOLAR AND MAGNETIC OBSERVATIONS.

By Louis A. Bauer.

Renewed interest has been awakened recently in the precise relationship between disturbances on the sun as revealed by sunspots and prominences, for example, and disturbances in the earth's magnetic and electric condition as disclosed conspicuously by magnetic storms and polar-light displays. Thus at the Brussels meeting last July of the committee appointed by the International Research Council for the study of solar and terrestrial relationships the following resolution was passed:

> "The committee recommend that solar observatories should make additional observations on the sun, as nearly continuous as possible, at or about the times when magnetic storms are in progress, or when they may be expected in accordance with the 27-day recurrence-tendency. This would necessitate the organization of a service for the supply of information to solar observatories as to magnetic storms, prospective or in progress. The committee recommend that Dr. L. A. Bauer, the secretary of the Section of Terrestrial Magnetism and Electricity of the International Union for Geodesy and Geophysics, be asked to formulate a scheme for this service."

At the recent Cambridge meeting of the Commission on Solar Physics of the International Astronomical Union this resolution was discussed and favorable action was taken as to the participation of those interested in solar research.

The arrangements in progress for this joint investigation by astronomers and geophysicists were described.

ON THE VARIATION OF MASS IN A BINARY SYSTEM.

By Ernest W. Brown.

This communication was a correction of an error in a paper by the speaker (*Proceedings, National Academy of Sciences*, **11**, 275). He now agrees with Dr. Jeans that a loss of mass in either component of a binary system will increase the mean distance and period but will not sensibly affect the eccentricity.

NOTE ON MERTON'S METHOD FOR THE DETERMINATION OF ORBITS.

By R. T. Crawford.

In this note are reviewed some of Merton's comments on Leuschner's methods of deriving preliminary orbits, and in particular there are presented statistics based upon the experience of the Berkeley computers

which are not in accord with Merton's statement that Leuschner's method when tested fails to represent the observations exactly, so that in every case a differential correction is necessary, and that this extra work more than offsets the shortness of the preliminary solution.

Of the forty-two orbits (direct solutions) computed at Berkeley by Leuschner's method since 1905, seventeen have required differential corrections. Of these seventeen, thirteen of the orbits were either based upon erroneous observations, or were ellipses of short period (5 to 8 years). Of the remaining four, two were based upon two-weeks arcs. In cases where the observations extend over two weeks a preliminary orbit based upon a shorter arc is usually available, so that a direct solution is not necessary. When a preliminary orbit is at hand Leuschner's method is that of differentially correcting this preliminary orbit to represent the observations of the longer arc. Such a process takes but little more time and labor than a direct solution without differential correction. Thus experience with Leuschner's method at Berkeley shows that about five per cent of the cases of preliminary orbits based upon an arc of a week or less require differential corrections to the direct solution. Most of these are probably necessitated by small errors of observations. It is highly probable that with perfect observations covering an arc of a week or less a differential correction would *rarely* be necessary, instead of being necessary, as Merton states, in *every* case.

STATISTICAL STUDIES OF STARS WITH SPECTRA IN CLASS Be.

By Ralph H. Curtiss.

With the conclusion of important surveys at Harvard and Mount Wilson the discoveries of Class B spectra with visible hydrogen emission have reached a total of 229. Of these, 187 are assigned to spectral divisions ranging from Oe or O6 to A2. The other forty-two, averaging faint, are classed as Be, Ae, P Cygni type, or in rare cases peculiar.

Three hundred so-called Be stars are probably within reach of survey instruments as they have been used, supplemented by slit spectrographs on brighter stars. For stars brighter than 8.26 an upper limit of 350 in Class Be is provisionally set up.

Class Be stars occur with greatest frequency on the average at division B2.5 or thereabouts with greatest numbers in the range B0 to B5. The percentage of emission stars in the spectral divisions increases markedly from the lower limit of the group near A2 to the top of the spectral sequence. The distribution-curve over the spectral divisions for stars brighter than 4.26 is fairly symmetrical about a maximum somewhere between B3 and B5. For fainter stars these distribution curves become asymmetric with a sharp rise from Class O and a slow fall along the later divisions of Class B. Fainter stars in the later spectral divisions of the emission group are probably relatively scarce and with relatively weak emission lines. Seven stars in Class O and

five in divisions A0 to A2 represent the outlying sections of the distribution curve of the Be group.

With brighter magnitudes there is a pronounced increase in the proportion of B stars known to have emission lines. Allowing for a discovery factor dependent on magnitude, accentuated perhaps by reduced average brightness of the hydrogen emission lines in fainter stars, it still appears that stars which are intrinsically brightest in Class B tend more strongly to develop visible emission in their spectra.

The intensity of the Hα and Hβ emission lines increases on the average with the number of hydrogen emission lines in Be spectra; and this is obviously true in general of emission lines in the Balmer series.

Of the stars in the Be group those having early spectra in Class B tend to develop more and stronger emission lines of hydrogen. This effect is pronounced for the brighter stars and probably will be shared by the fainter stars when the data are more nearly complete. For all magnitudes combined there is a maximum of 2.8 hydrogen emission lines visible in Class B2e.

The Be stars show the high concentration toward the galactic equator characteristic of normal Class B. Ten groups are notable of which three are at considerable galactic distances. Some but not all of these groups stand out in Shapley's charts of normal B stars. Considered by magnitudes the Be stars show some departures from the galactic distribution of normal B stars that may be significant.

The galactic distances of the fainter Be stars average less, and their median latitudes approach the galactic equator more closely than those of B stars. This may mean that the Be stars of any magnitude average farther away than the normal B stars and are for this reason to be considered intrinsically brighter.

The proper motions of the Be stars average slow for their spectral class and apparent magnitude. Studies of motions and magnitudes of B stars as a class and of moving clusters unite in assigning relatively high luminosities to the Be stars. Notable individual examples are S Doradus, α Cygni, and γ Cassiopeiae. Probably this high luminosity is associated with great mass. It is notable that these characteristics of high luminosity and great mass together with high ionization (early spectral class) are those which according to radiation theory are favorable to the visibility of emission lines in stellar spectra.

THE SPECTRUM OF NOVA PICTORIS, 1925.

By Paul Davidovich.

Photographic records of the spectrum of Nova Pictoris have been carried on systematically at the Arequipa Station of the Harvard Observatory since May 27, and a detailed study of the spectrum has been undertaken. The early spectrum of the Nova almost exactly matches that of ι^1 Scorpii, a star of class cF5. But ι^1 Scorpii has a characteristic

super-giant spectrum, and thus the above similarity gives us another striking indication that a nova near its maximum brilliancy displays a spectrum characteristic of super-giant stars, as has been established in the case of Nova Aquilae 1918, the difference being that Nova Aquilae shows an earlier spectrum, matching that of α Cygni, class cA2.

In the spectrum of Nova Pictoris, about 80 separate absorption lines can be found, comprising about 120 different lines, which belong to hydrogen, neutral and ionized iron, titanium, scandium, calcium, strontium, manganese, and other elements. After maximum light, on June 9, the spectrum rapidly changed to a typical nova spectrum, showing broad emission bands of hydrogen and metals. From an estimate of intensity of some absorption lines used for determination of the luminosity of stars (Mount Wilson method), the provisional absolute magnitude of Nova Pictoris was found to be at maximum light about —5, or somewhat higher.

A detailed investigation of plates secured—the number of which now exceeds 100—is in progress.

SOME NEBULAE RECENTLY PHOTOGRAPHED WITH THE 100-INCH HOOKER TELESCOPE.

By John C. Duncan.

Four photographs, selected from forty-one that were made by the writer at Mount Wilson during the summer of 1925, illustrate the following objects:

1. A nebulous mass, shaped somewhat like a pelican, situated about halfway between α Cygni and the "Isthmus" of the North America nebula. Two photographs, of exposure times $3^h\ 30^m$ and $4^h\ 45^m$, agree in showing a remarkable aggregation of luminous and obscure nebulosities, somewhat similar to the southern end of the neighboring America nebula and to M 16 and M 8 which lie farther south in the Milky Way. The brightest part of the nebula is indented by four slender dark markings, the largest of which is about 2′.5 long and contains a luminous core. Irregularly curved, bright filaments are noticeable at the south end of the brightest part. A patch of very faint stars, about four minutes long, is seen through, or possibly superposed upon, a faint portion of the luminous nebula. At a salient turn in the line that divides the dark from the bright nebulosity is situated the 7.6-magnitude star HD 199178, of which the spectroscopic parallax determined by Adams indicates a distance of 220 light-years.

2. Faint nebula following γ Cygni by 6 minutes of time. A Hooker plate of 4^h exposure, confirmed by a plate made with the 60-inch telescope, exposure 2^h, shows a mottling of bright and dark nebulosities, with an especially prominent dark marking that extends southwestward from the 8.8-magnitude star BD +39°4206. The region covered in-

cludes the variable star RW Cygni and a tenth-magnitude star that is here shown to be nebulous.

3. Faint nebula 1′.6 north of and 5^m preceding γ Cygni. Similar in general appearance to No. 2, even to including another nebulous star. The exposure time is 4 hours.

4. The dark nebula Barnard 86 Sagittarii. Exposure time $2^h\ 30^m$, confirming and improving upon a photograph made with 2^h exposure in 1921. At the altitude at which this southern object was photographed (25°-28°), the atmospheric dispersion is sufficient to elongate the images formed in the focus of the Hooker telescope to little spectra of perceptible length. The object, probably the most striking of Barnard's nebulae, stands out very clearly against a background of stars.

NEW APPARATUS AT THE AMHERST COLLEGE OBSERVATORY.

By Warren K. Green.

After the preliminary plans for the Amherst College Observatory had been accepted, the architects introduced a cylindric section into the large dome for the purpose of improving the external appearance of the building. In so doing they neglected to raise the floor by a corresponding amount, with the result that the polar axis of the telescope was about four feet below the bottom of the dome. To avoid the difficulties thus introduced, the whole instrument was set upon a pedestal which brought the eyepiece nine feet from the floor when observing in the zenith, and twenty-five feet from the floor when observing near the horizon. The dome itself was constructed in a superlatively heavy fashion, and could only be turned by hand with great difficulty.

The only facility provided for observing with the eighteen-inch refractor was a rickety step ladder of herculean proportions. The first task of the writer, when he took charge of the observatory in 1921, was to arrange some sort of observing platform which would be both safe and convenient. A rising floor was first considered, but the cost of such an installation was found to be prohibitively high. The scheme finally adopted is an electrically operated observing platform. This platform travels about the dome on a circular track and may be raised and lowered through a range of twelve feet. An electric turning mechanism for the dome was also designed and installed. The power controls are all carried to the platform by flexible cables which prevent the many difficulties incident to trolley wires. The control buttons for both motions of the platform and for the dome motor are so placed that the observer does not have to leave his seat throughout a full night's observing unless it becomes necessary to reverse the instrument.

The most important piece of auxiliary apparatus which has been thus far added to the equipment of the observatory is a self-recording wedge photometer. This instrument is similar in principle to the Rumford instruments, but it has an improved system of diaphragms for increas-

ing the similarity in appearance of the artificial and real stars. There is also a very efficient self-recording device attached to the instrument which obviates the necessity of turning on lights for the purpose of reading wedge settings. This increases the efficiency of the instrument both by diminishing the time required at the telescope for a long series of observations and also increasing the accuracy of successive settings, since the eye is not desensitized by exposing it to reading lights. The calibration of the instrument is nearly complete, and results concerning the accuracy of the instrument will be published soon.

FOUR DOUBLE-LINED F-TYPE SPECTROSCOPIC BINARIES.

By W. E. Harper.

During the past two or three years observations have been secured incidentally of several spectroscopic binaries. Of the four here treated two were discovered to be binaries at other observatories and two at our own. The four investigated, moreover, are all of F-type with the additional interesting feature of showing the spectra of both components. In two of these the spectrum lines are nearly of equal strength, in the other two one set of lines is on the average two or three times as intense as the other.

The stars under consideration are given in the following table:

Star	α 1900 h m	δ 1900 ° ′	Visual Magnitude	Spectrum
63 Geminorum	7 21.8	+21 39	5.27	F5
σ^2 Coronae Borealis	16 10.9	34 07	5.76	F8
H. R. 7267	19 04.2	16 42	6.46	F5
H. R. 8257	21 30.9	+27 46	6.35	F3

In spectra of this type with numerous lines it is exceedingly difficult when both spectra are showing to assign a value for the relative intensities of the lines due to each component. As the lines oscillate back and forth the general appearance of the resulting spectrum undergoes great changes due to the blending, either partial or complete, of neighboring lines. This is especially true where the component spectra are of unequal intensity.

In the star H. R. 7267 the lines have about equal strength and it turns out that the semi-amplitudes of velocity variation and consequently the masses are equal. In the star σ^2 Coronae Borealis there is sufficient difference in the spectra to distinguish between them and corresponding small differences in the masses are shown. In the other two stars the mass of the secondary is in each case about 0.8 times that of the main component, but the spectrum lines for the main components are from two to three times as strong as those of the secondaries. There are a few lines such as λ 4215 which are fairly well isolated and these suggest a ratio of two or three to one. When a spectrum showing the lines completely superposed is studied in connection with those

having the lines resolved the resulting character of the spectrum is fairly well accounted for on the assumption that the general intensities of the lines of the main component are two and one-half times that of the secondary. There would seem, however, to be some slight evidence that this ratio was not constant, as if the lines of a component increased in strength when that component was approaching us in its orbit.

The periods of the stars, in the order given above, are, in round numbers, 1.9, 8.0, 4.8, and 12.2 days, the first three orbits being nearly circular, the last one having an eccentricity 0.32. The masses multiplied by $sin^3\ i$ range from 0.8 to 1.3 times the sun or in effect the minimum masses for the whole eight components are each just comparable to the sun. The probable errors of a plate range from 3.2 to 7.0 km per sec., somewhat larger than usual with our single-prism on F-type stars, but due no doubt to errors consequent upon the partial blending of close lines.

Fuller details are given in a publication now in press.

AN INTERNATIONAL CO-OPERATION FOR THE PHOTOGRAPHIC STUDY OF CEPHEID VARIABLES.

By F. Henroteau.

At the recent meeting of the International Astronomical Union, a coöperation for the study of light variations in short period Cepheid variables was proposed by the writer, according to methods devised and tested at Ottawa, and was approved.

The importance of determining light-curves during the time interval of one period is considerable, as there are strong indications that remarkable changes of shape and amplitude of many curves occur from cycle to cycle. An exact knowledge of these changes would help toward the solution of the still puzzling problem of Cepheid variation.

If the oscillation in brightness has a period approximating one to a few days, on account of daylight, moonlight and cloudy weather, it is absolutely impossible to determine complete light-curves of the variable during individual cycles of variation, at one single observatory. If, however, the same variables are studied at a series of observatories of different longitudes, it may be possible to obtain a continuous series of observations, furnishing un-interrupted light-curves.

The proposal of coöperation was favorably received, the following observatories having already definitely agreed to take part in the work: Ottawa, Lisbon, Lyons, Masnieres, Berlin, Copenhagen and Lahore. Others which will probably coöperate are Aix en Provence, Teramo, Kichinev (Bessarabie), Kyoto, Tokyo, and possibly Flagstaff.

Among other institutions which have been invited to enter the scheme are: Tucson (Arizona), Tacubaya (Mexico), Moscow, Taschkent (Turkestan), Calcutta, Zo-Se (China), Manila and Honolulu. Another observatory in the eastern or middle west part of the United States is

still greatly needed. It is thought of great importance to have the active coöperation of scientists in the United States, and to bring the matter before the American Astronomical Society for the knowledge of all.

The necessary arrangements have already been made among a number of coöperating observatories for the determination of the photographic magnitudes of forty or fifty comparison stars in the field of each variable.

TWO NEW VARIABLE STARS.

By C. M. Huffer.

HD 25833

R. A. $4^h\ 0^m.6$, Dec. $+33°\ 11'$, mag. 6.61, spectrum B3 (two spectra). A spectroscopic orbit was published by J. A. Pierce in the *Journal of the Royal Astronomical Society of Canada*, **19**, 156, 1925.

The star was placed on the program of the Washburn Observatory for observation with the photo-electric photometer, and was found to be variable from observations made November 10 and 13, 1925. It has been observed to date on seven nights, the change of brightness being 0.32 magnitude. From Pierce's elements, the following have been computed:

$$t_1 = \text{J. D. } 2424039.644 + 2^d.02858 \cdot E$$
$$t_2 - t_1 = 1^d.072$$

Boss 1607

R. A. $6^h\ 18^m.0$, Dec. $+56°\ 20'$, mag. 5.50, spectrum A3. A spectroscopic orbit was published by Harper in the *Publications of the Dominion Observatory*, **2**, 167, 1915. This star was discovered to be variable on December 13, 1924, while being used as a comparison star for observations of 45 Aurigae. The primary minimum was reobserved on November 16, 1925. It has been observed on seven nights, the change of brightness being about four-tenths of a magnitude. There is also a decrease at the phase of the computed secondary eclipse. The following light elements were computed from Pierce's spectroscopic elements:

$$t_1 = \text{J. D. } 2419350.204 + 9^d.944 \cdot E$$
$$t_2 - t_1 = 4^d.516$$

Photo-electric observations show the primary eclipse to fall about half a day later than the predicted time. By assuming the period to be $9^d.9449$, the primary minimum will fall at zero phase.

(To be continued.)

SOLAR SPECTROSCOPY.

By JACK GARRISON.

Many amateurs in astronomy never have thought to turn their attention toward the physical part of this science, but some very interesting and instructive work can be done in this direction with some home-made apparatus, which may be constructed at a very small cost, with the help of some tools and other material. So if the following instructions are carried out an instrument with which much valuable information may be gained can be built. Bear in mind all the while that the main thing in constructing such an instrument is rigidity of the different parts.

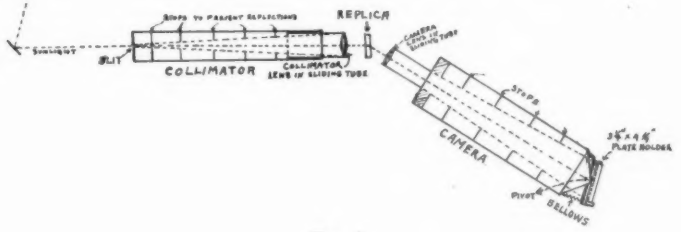


FIG. 1.

Procure first two lenses from one and one-half to two inches in diameter with a focus of about thirty inches, and a good replica of a grating (a Thorps preferred) the ruling of which is about 14,000 lines per inch. Then the attention can be directed toward the building of the stand and the tubes. The collimator tube (referring to Fig. 1) should be made of wood and it should be about twenty-five inches long and three inches square. It should be provided with several stops or diaphragms and another tube ten inches long and just large enough to slide snugly into the longer tube. This is for focusing. In the smaller tube mount one of the lenses, while in the end of the larger mount a slit. This last article may be made or purchased. This comprises the collimator and the collimator is in adjustment when the slit is at the focus of the lens.

Next the camera can be made, which, as can be seen from the Figure, is another wooden box of larger dimensions, with a lens at one end and a dark slide at the other, and also notice that it is provided with stops. This box can be made of light wood about twenty-five inches long and four by five inches laterally. It will be noted from the figures that the dark slide is supported in such a manner that it may be tilted sideways and be caused to slide vertically up and down. The first motion is to place the plate in such a position that all of the spectrum

can be in focus at once, for it must be remembered that some colors of the spectrum are refracted more than others, and as the camera lens is not achromatic it is necessary to place the portion of the plate receiving the violet rays nearer the lens than the portion receiving the red. The second motion allows more than one spectrum, which is rather narrow, to be photographed on one plate. These two motions can be planned from the drawing, but be sure that all of the apparatus is light tight and that both tubes are blackened inside or the plates will be fogged. At the front of the box there must be the other lens mounted in a tube which must be allowed to slide in and out for focusing as shown in the plan.

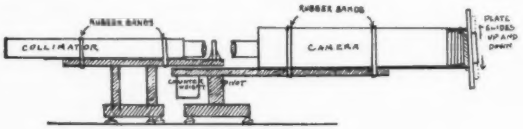


FIG. 2.

Now referring to Figure 2 it will be seen that the collimator is mounted on a base which is immovable, while the base belonging to the camera has the arm pivoted upon which the latter is mounted, and that the pivot is directly below the replica grating. This is necessary so that the camera may always be pointing in the direction of the grating. After constructing these bases, the collimator and the camera can be secured to them by means of straps or, after a method of the author, by means of rubber bands cut from an old inner tube.

Now it is only necessary to place the grating in its holder and, having directed a beam of light by means of mirrors on the slit as shown in Figure 1, to move the camera into about the position shown, to cause the spectrum to appear on a ground glass screen placed in the dark slide holder. If the collimator be in focus the reversed lines of the solar spectrum can be seen.

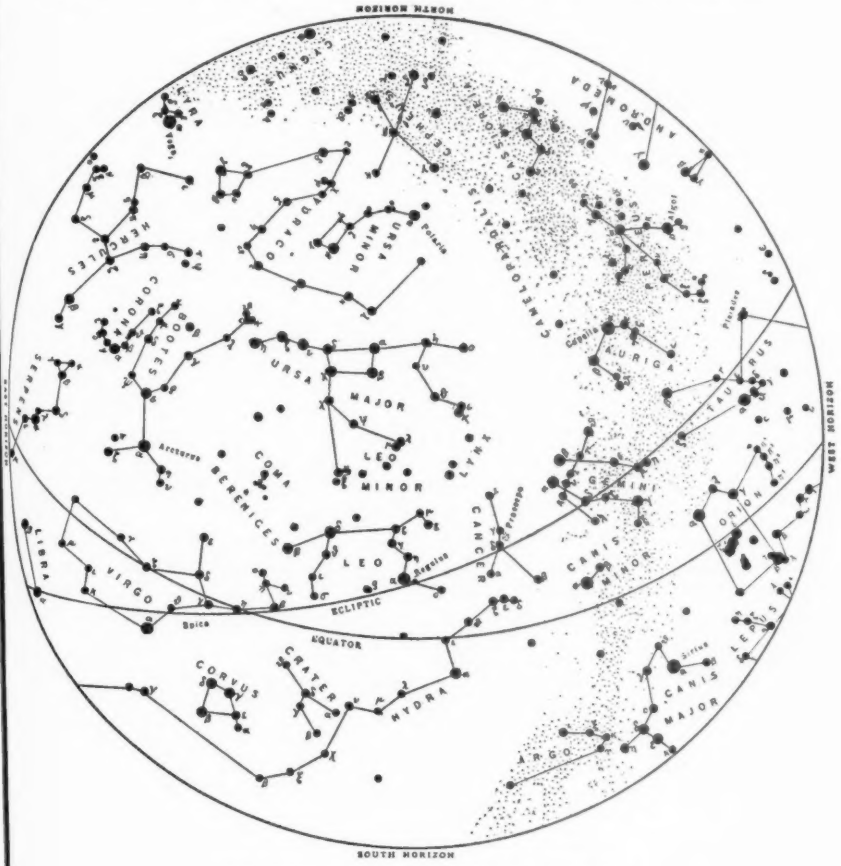
When the instrument is well in focus some trial exposures may be tried. These must be made at the blue end of the spectrum because the ordinary dry plate is only sensitive to the shorter vibrations. Do not be discouraged if they are not perfect because it will require some experience to adjust the proper plate tilt and to focus the collimator and the camera.

In constructing my own instrument on this plan I was greatly assisted by Dr. George E. Hale, the director of the Mount Wilson Observatory, who personally advised me to follow this line of construction.

802 Hamilton Ave., Indianapolis, Ind.

PLANET NOTES FOR APRIL.

The *Sun* will be moving northward rapidly during April. Its declination will change from +4° 10′ to 14° 28′. It will move from the constellation Pisces into Aries. At the end of the month it will be only a short distance west of the Pleiades. This familiar group of stars will serve to make vivid the apparent



THE CONSTELLATIONS AT 9:00 P.M. APRIL 1.

motion of the sun through the sky. By noting from evening to evening the fact that the Pleiades are getting nearer and nearer the horizon at sunset, anyone may have visible evidence that the sun is approaching this group. Then by waiting a month or two and again noting the fact that from morning to morning this same group of stars is higher and higher at sunrise, the evidence becomes complete that the sun has passed by and is continuing its journey eastward.

The phases of the *Moon* will occur as follows:

Last Quarter	April	5 at	3 P. M. C.S.T.
New Moon		12 "	7 A.M. "
First Quarter		19 "	5 P. M. "
Full Moon		27 "	6 P. M. "

The moon will be at perigee on April 10, and at apogee on April 21.

Mercury will be almost directly between the earth and the sun at the beginning of this month and will therefore be invisible at that time. It will have an apparent motion westward and the sun will have its customary motion eastward. The two will be separating in the sky until April 28, at which time Mercury will be at a point of greatest western elongation. This is the season to see Mercury as a morning star. It will be about ten degrees south of the sun, which fact will make its time of rising later, as compared with the sun, for places in northern latitudes.

Venus will continue to be the conspicuous morning star during this month. On April 18 it will be at a point of greatest western elongation, and will rise nearly three hours before the sun. It will then be in the constellation Pisces, a few degrees south of the equator. Its stellar magnitude at this time will be —4.0, which means that it will be about 100 times as brilliant as Aldebaran, a typical star of magnitude 1.0.

Mars will be moving eastward nearly as rapidly as the sun. It will cross the meridian about 8 o'clock A. M. If observed during this month, it will have to be observed in the morning. It will be 16° south of the equator, in the constellation Capricornus.

Jupiter also will be in the morning sky, very near the planet Mars. Jupiter. Venus, and Mars will form an interesting group during this month. Their brilliancy will not fail to attract the attention of anyone who may be out before sunrise during this month.

Saturn will be on the meridian soon after midnight during April. It will therefore be in a position to be observed and studied in the late evening. It will be in the constellation Libra.

Uranus, having been in conjunction with the sun on March 16, will not yet be far enough out from the sun for favorable observation. It will cross the meridian about two hours ahead of the sun.

Neptune will still be in favorable position for observation. It will be on the meridian about 8 o'clock in the evening.

Saturn's Satellites.

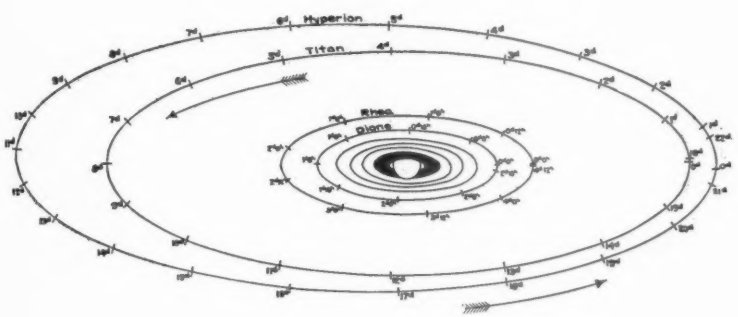
[From the *American Ephemeris.*]

CENTRAL STANDARD TIME, MIDNIGHT = 0^h

I. Mimas. Period 0^d 22^h6.

1926	d	h		d	h		d	h		d	h
April	1	2.6 E	April	9	2.8 W	April	17	3.0 E	April	24	4.6 W
	2	1.2 E		10	1.4 W		18	1.6 E		25	3.2 W
	2	23.8 E		11	0.0 W		19	0.2 E		26	1.8 W
	3	22.4 E		11	22.6 W		19	22.8 E		27	0.5 W
	6	7.0 W		12	21.2 W		20	21.4 E		27	23.1 W
	7	5.6 W		15	5.8 E		21	20.1 E		28	21.7 W
	8	4.2 W		16	4.4 E		23	6.0 W		29	20.3 W

South



North

Apparent orbits of the seven inner satellites of Saturn at date of opposition, May 14, 1926, as seen in an inverting telescope.

II. Enceladus. Period $1^d\ 8^h9$.

1926	d	h		d	h	1926	d	h		d	h
April	0	20.6 E	April	9	1.8 E	April	17	7.1 E	April	25	12.4 E
	2	5.5 E		10	10.7 E		18	16.0 E		26	21.3 E
	3	14.3 E		11	19.6 E		20	0.9 E		28	6.2 E
	4	23.2 E		13	4.5 E		21	9.8 E		29	15.1 E
	6	8.1 E		14	13.3 E		22	18.6 E			
	7	17.0 E		15	22.2 E		24	3.5 E			

III. Tethys. Period $1^d\ 21^h3$.

April	2	7.0 E	April	9	20.2 E	April	17	9.3 E	April	24	22.5 E
	4	4.3 E		11	17.4 E		19	6.6 E		26	19.7 E
	6	1.6 E		13	14.7 E		21	3.9 E		28	17.0 E
	7	22.9 E		15	12.0 E		23	1.2 E		30	14.3 E

IV. Dione. Period $2^d\ 17^h7$.

April	2	17.2 E	April	10	22.2 E	April	19	3.2 E	April	27	8.1 E
	5	10.9 E		13	15.9 E		21	20.8 E		30	1.8 E
	8	4.6 E		16	9.6 E		24	14.5 E			

V. Rhea. Period $4^d\ 12^h5$.

April	3	5.4 E	April	12	6.1 E	April	21	6.8 E	April	30	7.4 E
	7	17.8 E		16	18.5 E		25	19.1 E			

VI. Titan. Period $15^d\ 23^h3$.

April	7	19.7 W	April	15	15.4 E	April	23	17.3 W			

VII. Hyperion. Period $21^d\ 7^h6$.

April	7	22.5 W	April	17	19.7 E	April	29	3.0 W			

VIII. Japetus. Period $79^d\ 22^h1$.

			April	9	23.9 I	April	29	16.7 W			

NOTE—E, Eastern Elongation; W, Western Elongation; S, Superior Conjunction; I, Inferior Conjunction.

Occultations Visible at Washington.

[From the *American Ephemeris.*]

Date 1926	Star's Name	Magnitude	IMMERSION. Washington C.T. h m	IMMERSION. Angle from N °	EMERSION. Washington C.T. h m	EMERSION. Angle from N °	Duration h m
Apr. 16	372 B. Tauri	6.1	19 55	125	20 50	233	0 54
18	149 B.Geminorum	6.4	23 14	28	23 31	354	0 17
18	63 Geminorum	5.3	23 30	50	0 6	331	0 36
23	*l* Leonis	5.3	2 55	168	3 27	236	0 32
26	566 B. Virginis	6.4	19 9	42	19 26	15	0 16
30	ξ Ophiuchi	4.4	23 6	45	23 38	351	0 32

Asteroids Discovered in the Year 1924-25.—According to the report in *Astronomische Nachrichten*, No. 5417, there were 84 asteroids discovered during the interval between July 1, 1924, and June 30, 1925. Of these, 5 were identified with objects previously discovered and 79 were new. For 22 of them there were sufficient observed positions to determine elliptic orbits and these have received permanent numbers, bringing the total now up to 1046.

The discoverers were as follows:

Place	Discoverer	No.	Place	Discoverer	No.
Algiers	B. Jekhowsky	4	Moscow	J. Kasansky	5
Barcelona	Comas Solá	1	Simeis	V. Albitzky	7
Bergedorf	W. Baade	1		S. Beljawsky	9
Heidelberg	K. Reinmuth	25		G. Shajn	1
	M. Wolf	17	Uccle	E. Delporte	1
Johannesburg	H. E. Wood	2	Wien	J. Palisa	1
	E. Hertzsprung	2	Williams Bay	G. Van Biesbroeck	3

VARIABLE STARS,

Maxima of Variable Stars of Short Period.

[Calculated by members of the classes in Astronomy at Carleton College.]

Given to the nearest hour in Greenwich civil time; to obtain Eastern Standard time subtract 5^h; Central Standard time 6^h, etc.

Star	R.A. 1900 h m	Decl. 1900 ° ′	Magnitude	Approx. Period d h	Greenwich civil times of maxima in 1926 April d h	d h	d h	d h
SX Cassiop.	0 05.5	+54 20	8.6— 9.2	36 13.7				
SY Cassiop.	0 0[illegible]	+57 52	9.3— 9.9	4 01.7	6 23	15 2	23 6	
RR Ceti	1 27.0	+ 0 50	8.3— 9.0	0 13.3	2 8	10 1	17 19	25 13
RW Cassiop.	1 30.7	+57 15	8.9—11.0	14 19.2	5 1		19 19	
V Arietis	2 09 6	+11 46	8.3— 9.0	0 23.8	3 14	11 12	19 11	27 9
SU Cassiop.	2 43.0	+68 28	6.5— 7.0	1 22.8	3 22	11 17	19 12	27 8
RW Camelop.	3 46.2	+58 21	8.2— 9.4	16 00.0		9 13		25 22
SX Persei	4 10.2	+41 27	10.4—11.2	4 07.0	1 3	9 17	18 6	26 21
SV Persei	42.8	+42 07	8.8— 9.6	11 03.1	2 14	13 17	24 20	
RX Aurigæ	4 54.5	+39 49	7.2— 8.1	11 15.0		11 12	23 3	
SX Aurigæ	5 04.6	+42 02	8.0— 8.7	1 12.8	3 10	11 2	18 18	26 9
SY Aurigæ	05.5	+42 41	8.4— 9.5	10 03.3	9 17	19 21	30 0	
Y Aurigæ	21.5	+42 21	8.6— 9.6	3 20.6	8 5	15 22	23 15	
RZ Gemin.	5 56.6	+22 15	9.1—10.0	5 12.7	5 20	11 9	22 10	27 23
RS Orionis	6 16.5	+14 44	8.2— 8.9	7 13.6	2 7	9 21	17 11	25 1
T Monoc.	19.8	+ 7 08	5.7— 6.8	27 00.3		19 7		
RT Aurigæ	23.0	+30 33	5.1— 6.0	3 17.5	1 17	9 4	16 15	24 2
W Gemin.	29.2	+15 24	6.7— 7.5	7 22.0	4 12	12 10	20 8	28 6

Maxima of Variable Stars of Short Period—Continued.

Star	R.A. 1900	Decl. 1900	Magnitude	Approx. Period	Greenwich civil times of maxima in 1926							
					April							
	h m	° ′		d h	d h	d h	d h	d h	d h	d h	d h	d h
ζ Gemin.	6 58.2	+20 43	3.7— 4.3	10 03.7	4 13	14 17	24 20					
RU Camelop.	7 10.9	+69 51	8.5— 9.8	22 06.5	7 1						29 13	
RR Gemin.	7 15.2	+31 04	10.0—11.5	0 09.5	4 16	12 14	20 13	28 11				
V Carinae	8 26.7	—59 47	7.4— 8.1	6 16.7	1 23	8 14	22 1	28 18				
T Velorum	8 34.4	—47 01	7.6— 8.5	4 15.3	1 21	11 3	20 10	29 17				
V Velorum	9 19.2	—55 32	7.5— 8.2	4 08.9	5 21	14 15	23 9					
Z Leonis	9 46.4	+27 22	7.9— 9.6	56 08.7								
RR Leonis	10 02.1	+24 29	9.1—10.1	0 10.9	4 2	10 21	17 16	24 10				
SU Draconis	11 32.2	+67 53	8.9— 9.6	0 15.8	3 5	9 19	23 1	29 15				
S Muscae	12 07.4	—69 36	6.4— 7.3	9 15.8	3 10	13 2	22 18					
SW Draconis	12.8	+70 04	8.8— 9.6	0 13.7	4 19	12 19	20 18	28 18				
T Crucis	15.9	—61 44	6.8— 7.6	6 17.6	2 18	9 12	22 23	29 16				
R Crucis	18.1	—61 04	6.8— 7.9	5 19.8	3 18	9 14	21 6	27 1				
S Crucis	12 48.4	—57 53	6.5— 7.6	4 16.6	2 21	12 6	16 23	26 8				
W Virginis	13 20.9	— 2 52	8.7—10.4	17 06.5	2 13		19 19					
SS Hydræ	25.0	—23 08	7.4— 8.1	8 04.8	5 17	13 22	21 2	29 7				
RV Urs. Maj.	13 29.4	+54 31	9.2— 9.9	0 11.2	3 0	10 0	17 1	24 1				
ST Virginis	14 22.5	— 0 27	10.3—11.4	0 09.9	6 0	13 10	20 19	28 5				
V Centauri	25.4	—56 27	6.4— 7.8	5 11.9	1 11	12 10	17 23	28 22				
R3 Bootis	29.3	+32 11	8.9—10.0	0 09.1	7 19	15 8	22 21	30 10				
R Triang.Austr.	15 10.8	—66 08	6.7— 7.4	3 09.3	1 1	7 20	21 9	28 4				
S Triang.Austr.	15 52.2	—63 29	6.4— 7.4	6 07.8	3 17	10 1	22 17	29 1				
S Normæ	16 10.6	—57 39	6.6— 7.6	9 18.1		10 16	20 10	30 4				
RW Draconis	33.7	+58 03	9.6—10.8	0 10.6	3 23	12 19	21 16	30 13				
RV Scorpii	16 51.8	—33 27	6.7— 7.4	6 01.5	4 21	10 23	23 2	29 3				
X Sagittarii	17 41.3	—27 48	4.4— 5.0	7 00.3	6 15	13 15	20 15	27 16				
Y Ophiuchi	47.3	— 6 07	6.1— 6.5	17 02.9		11 1		28 3				
W Sagittarii	17 58.6	—29 35	4.3— 5.1	7 14.3	2 12	10 2	17 16	25 6				
Y Sagittarii	18 15.5	—18 54	5.4— 6.2	5 18.6	3 2	8 21	20 10	26 5				
U Sagittarii	26.0	—19 12	6.5— 7.3	6 17.9	1 16	8 10	21 21	28 15				
Y Scuti	32.6	— 8 27	8.7— 9.2	10 08.3		10 1	20 10	30 18				
RZ Lyræ	39.9	+32 42	9.9—11.2	0 12.3	3 1	10 17	18 9	26				
RT Scuti	18 44.1	—10 30	9.1— 9.7	0 11.9	8 0	15 11	22 21	30 8				
κ Pavonis	18 46.6	—67 22	3.8— 5.2	9 02.2	6 13	15 15	24 17					
U Aquilæ	19 24.0	— 7 15	6.2— 6.9	7 00.6	5 22	12 22	19 23	26 23				
XZ Cygni	19 30.4	+56 10	8.6— 9.3	0 11.2	5 5	12 5	19 5	26 5				
U Vulpec.	32.2	+20 07	6.5 - 7.6	7 23.5	8 16	16 16	24 16					
SU Cygni	40.8	+29 01	6.2— 7.0	3 20.3	3 13	11 6	18 23	26 15				
η Aquilæ	47.4	+ 0 45	3.7— 4.5	7 04.2	3 3	10 7	17 11	26 15				
S Sagittæ	51.5	+16 22	5.6— 6.4	8 09.2	1 1	9 11	17 20	26 5				
X Vulpec.	19 53.3	+26 17	9.5—10.5	6 07.7	5 8	11 16	24 7	30 15				
X Cygni	20 39.5	+35 14	6.0— 7.0	16 09.3	4 8		20 18					
T Vulpec.	47.2	+27 52	5.5— 6.1	4 10.5	4 23	13 21	18 7	27 4				
UY Cygni	52.3	+30 03	9.6—10.4	0 13.5	1 14	8 21	23 11	30 18				
RV Capric.	55.9	—15 37	9.2—10.1	0 10.7	5 12	12 16	19 20	26 23				
TX Cygni	20 56.4	+42 12	8.5— 9.7	14 17.4		10 2		24 19				
VY Cygni	21 00.4	+39 34	8.8— 9.5	7 20.6	1 23	9 19	17 16	25 13				
SW Aquarii	10.2	— 0 20	9.9—10.8	0 11.0	2 5	9 2	22 21	29 18				
VZ Cygni	21 47.7	+42 40	8.2— 9.2	4 20.7	5 4	14 21	19 18	29 11				
Y Lacertæ	22 05.2	+50 33	9.1— 9.6	4 07.8	8 18	17 10	26 1					
δ Cephei	25.5	+57 54	3.7— 4.6	5 08.8	2 7	13 1	18 10	29 3				
Z Lacertæ	36.9	+56 18	8.2— 9.0	10 21.1	1 14	12 12	23 9					
RR Lacertæ	37.5	+55 55	8.5— 9.2	6 10.1	3 7	9 17	22 12	28 22				
V Lacertæ	44.5	+55 48	8.5— 9.5	4 23.6	4 17	14 17	19 16	29 15				
X Lacertæ	22 45.0	+55 54	8.2— 8.6	5 10.7	1 12	12 9	17 20	28 17				
SW Cassiop.	23 03.7	+58 11	9.2— 9.7	5 10.6	1 17	14 14	20 1	30 22				
RS Cassiop	32.6	+61 52	9.0—11.0	6 07.1	6 7	12 14	18 22	25 5				
RY Cassiop.	47.2	+58 11	9.3—11.8	12 03.4	6 4	19 7	30 10					
V Cephei	23 51.7	+82 38	6.0— 7.0	0 23.9	4 22	11 22	18 21	25 21				

Minima of Variable Stars of Short Period.

[Calculated by members of the classes in Astronomy at Carleton College.]

Given to the nearest hour in Greenwich civil time; to obtain Eastern Standard time subtract 5^h; Central Standard time 6^h, etc.

Star	R.A. 1900	Decl. 1900	Magnitude	Approx. Period	Greenwich civil times of minima in 1926							
					April							
	h m	° ′		d h	d h	d h	d h	d h	d h	d h	d h	d h
SY Androm.	0 08.0	+43 09	9.5—13.0	34 21.8								
RT Sculptor.	31.5	—26 13	9.6—10.5	0 12.3	4 9	12 1	19 17	27 9				
U Cephei	0 53.4	+81 20	7.0— 9.0	1 11.8	4 15	12 2	19 14	27 2				
Z Persei	2 33.7	+41 46	9.4—12	3 01.4	5 0	11 2	23 8	29 10				
TW Cassiop.	37.6	+65 19	8.2— 9.0	1 10.3	4 12	13 1	21 15	30 5				
RY Persei	39.0	+47 43	8.0—10.3	6 20.7	5 23	12 20	19 17	26 13				
RZ Cassiop.	3.9	+69 13	6.9— 8.1	1 04.7	3 22	11 2	18 6	25 10				
TX Cassiop.	44.4	+62 22	9.4—10.1	2 22.2	8 9	17 4	25 23					
ST Persei	53.7	+38 47	8.5—10.5	2 15.6	7 19	15 18	23 16					
RX Cassiop.	2 58.8	+67 11	8.6— 9.1	32 07.6		15 0						
Algol	3 01.7	+40 34	2.3— 3.5	2 20.8	7 2	15 16	24 7					
RT Persei	16.7	+46 12	9.5—11.5	0 20.4	3 22	10 17	17 12	24 7				
λ Tauri	55.1	+12 12	3.3— 4.2	3 22.9	8 9	16 7	24 4					
RW Tauri	3 57.8	+27 51	7.1— [11	2 18.5	5 6	13 14	21 21	30 4				
RV Persei	4 04.2	+33 59	9.5—11.0	1 23.4	7 16	15 13	23 11	27 10				
RW Persei	13.3	+42 04	8.8—11.0	13 04.8	5 20		19 0					
SZ Tauri	31.4	+18 20	7.2— 7.7	3 03.6	2 23	9 7	21 21	28 4				
RS Cephei	4 48.6	+80 06	9.5—12.0	12 10.1		12 1	24 11					
TT Aurigae	5 02.8	+39 27	7.8— 8.7	0 16.0	7 4	13 20	20 12	27 4				
RY Aurigae	11.5	+38 13	10.7—11.7	2 17.5	2 15	10 20	18 23	27 4				
RZ Aurigae	42.9	+31 40	10.6—13.3	3 00.3	7 0	13 1	19 1	25 2				
SV Tauri	45.8	+28 05	9.4—11.0	2 04.0	6 11	15 3	23 19					
Z Orionis	50.2	+13 40	9.7—10.7	5 04.9	2 6	12 17	23 2					
SV Gemin.	54.6	+24 28	9.8— [11	4 00.2	1 22	9 22	17 23	25 23				
RW Gemin.	5 55.4	+23 08	9.5—11.0	2 20.8	1 7	12 18	18 11	29 22				
U Columbæ	6 11.2	—33 03	9.2—10.0	2 19.2	5 12	11 3	22 7	27 22				
SX Gemin.	22.0	+20 37	10.8—11.5	1 08.8	8 7	16 11	24 16					
RW Monoc.	29.3	+ 8 54	9.0—10.8	1 21.7	5 18	13 9	21 0	28 15				
RX Gemin.	43.6	+33 21	8.8— 9.6	12 05.0	6 1	18 6	30 11					
RU Monoc.	6 49.4	— 7 28	9.8—10.5	0 21.5	7 2	14 6	21 11	28 15				
R Can. Maj.	7 14.9	—16 12	5.8— 6.4	1 03.3	6 1	12 20	19 16	26 11				
RY Gemin.	21.7	+15 52	8.9— [10	9 07.2	3 21	13 4	22 12	31 19				
Y Camelop.	27.6	+76 17	9.5—12	3 07.3	4 13	11 3	24 9	30 23				
TX Gemin.	30.3	+17 08	10.0—11.9	2 19.2	5 20	14 6	22 15					
RR Puppis	43.5	—41 08	9.4—10.7	6 10.3	3 6	9 17	22 13	28 23				
V Puppis	7 55.4	—48 58	4.1— 4.8	1 10.9	7 23	15 6	22 13	29 19				
X Carinae	8 29.1	—58 53	7.9— 8.7	0 13.0	5 2	13 4	21 8	29 10				
S Cancri	8 38.2	+19 24	8.2—10	9 11.6	2 6	11 18	21 5	30 17				
RX Hydrae	9 00.8	— 7 52	9.1—10.5	2 06.8	5 13	12 10	19 6	26 2				
S Velorum	29.4	—44 46	7.8— 9.3	5 22.4	4 8	10 6	22 3	28 1				
Y Leonis	9 31.1	+26 41	9.3—11.2	1 16.5	4 11	11 5	17 23	24 17				
RR Velorum	10 17.8	—41 36	10.0—10.9	1 20.5	2 8	9 18	17 4	24 14				
SS Carinæ	10 54.2	—61 23	12.2—12.8	3 07.2	5 6	11 20	18 11	25 1				
ST Urs. Maj.	11 22.4	+45 44	6.7— 7.2	8 19.2	3 12	12 7	21 3	29 23				
RW Urs. Maj.	35.4	+52 34	10.3—11.4	7 07.9	2 19	10 3	17 11	24 19				
Z Draconis	11 39.8	+72 49	9.9—13.6	1 08.6	6 21	13 16	20 11	27 6				
RZ Centauri	12 55.6	—64 05	8.5— 8.9	1 21.0	8 2	15 14	23 2	30 14				
RS Can. Ven.	13 06.3	+36 28	7.5—12.5	4 19.1		10 6	19 20	29 10				
SS Centauri	07.2	—63 37	8.8—10.4	2 11.5	4 9	11 19	19 6	26 16				
SX Hydræ	13 39.0	—26 23	8.6—12.7	2 21 5	1 15	13 5	19 1	30 14				

Minima of Variable Stars of Short Period—Continued.

Star	R.A. 1900	Decl. 1900	Magnitude	Approx. Period	Greenwich civil times of minima in 1926 April							
	h m	° ′		d h	d h	d h	d h	d h	d h	d h	d h	d h
δ Libræ	14 55.6	— 8 07	4.8— 6.2	2 07.9	6 7	13 7	20 6	27 6				
U Coronæ	15 14.1	+32 01	7.6— 8.7	3 10.9	6 15	13 12	20 10	27 8				
TW Draconis	15 32.4	+64 14	7.3— 8.9	2 19.4	3 19	12 5	20 15	29 1				
SS Libræ	15 43.4	—15 14	9.3—11.5	0 18.4	2 20	10 1	17 5	24 10				
SW Ophiuchi	16 11.1	— 6 44	9.2—10.0	2 10.7	7 21	15 5	22 14	29 22				
SX Ophiuchi	12.6	— 6 25	10.5—11.2	2 01.5	4 8	12 15	20 21	29 3				
R Aræ	31.1	—56 48	6.8— 7.9	4 10.2	4 14	13 10	22 6					
TT Herculis	16 49.9	+17 00	8.9— 9.3	20 18.1	2 11		23 5					
TU Herculis	17 09.8	+30 50	9.5—12	2 06.4	4 20	11 16	18 11	25 6				
U Ophiuchi	11.5	+ 1 19	6.0— 6.7	0 20.1	6 11	14 21	23 6					
μ Herculis	13.6	+33 12	4.6— 5.4	2 01.2	3 17	9 21	22 4	28 8				
TX Herculis	15.4	+42 00	8.3— 9.0	1 00.7	1 14	7 17	20 3	26 8				
RV Ophiuchi	29.8	+ 7 19	9. —12	3 16.5	3 23	11 8	18 17	26 2				
SZ Herculis	36.0	+33 01	9.5—10.3	0 19.6	1 22	10 3	18 7	26 11				
TX Scorpii	48.6	—34 13	7.5— 8.2	0 22.6	3 11	11 0	18 13	26 2				
UX Herculis	49.7	+16 57	8.8—10.5	1 13.2	1 4	8 22	16 15	24 9				
Z Herculis	53.6	+15 09	7.1— 7.9	3 23.8	8 1	16 0	24 0					
WX Sagittarii	53.6	—17 24	9.2—10.8	2 03.1	8 22	17 11	25 23					
WY Sagittarii	17 54.9	—23 01	9.5—10.6	4 16.0	4 11	13 19	18 11	27 19				
SX Draconis	18 03.0	+58 23	9.3—10.5	5 04.1	1 22	12 6	17 10	27 18				
RS Sagittarii	11.0	—34 08	5.9— 6.3	2 10.0	3 2	10 8	17 14	24 20				
V Serpentis	11.1	—15 34	9.5—11.1	3 10.9	5 10	12 7	19 5	26 4				
RZ Scuti	21.1	— 9 15	7.4— 8.3	15 03.2		12 8		27 11				
RZ Draconis	21.8	+58 50	9.5—10.2	0 13.2	3 8	10 12	17 15	24 19				
RX Herculis	26.0	+12 32	7.0— 7.6	0 21.3	4 15	11 18	18 21	25 23				
SX Sagittarii	39.7	—30 36	8.7— 9.8	2 01.8	5 16	13 23	22 7	30 14				
RR Draconis	40.8	+62 34	9.3—13	2 19.9	5 17	14 5	22 16					
RS Scuti	43.7	—10 21	9.3—10.3	0 15.9	7 0	13 15	20 6	26 22				
β Lyræ	46.4	+33 15	3.4— 4.1	12 21.8	7 16		20 13					
U Scuti	18 48.9	—12 44	9.1— 9.6	0 22.9	1 21	9 13	17 4	24 20				
RX Draconis	19 01.1	+58 35	9.3—10.2	1 21.4	3 21	11 11	19 1	26 15				
RV Lyræ	12.5	+32 15	11. —12.8	3 14.4	7 3	14 8	21 12	28 17				
RS Vulpec.	13.4	+22 16	6.9— 8.0	4 11.4	4 4	13 3	22 2					
U Sagittæ	14.4	+19 26	6.5— 9.0	3 09.1	6 4	12 23	19 17	26 11				
Z Vulpec.	17.5	+25 23	7.3— 8.5	2 10.9	3 16	11 0	18 9	25 18				
TT Lyræ	24.3	+41 30	9.4—11.6	5 05.8	4 6	14 17	19 23	30 11				
UZ Draconis	26.1	+68 44	9.0— 9.8	1 15.1	4 5	10 17	23 18	30 7				
SY Cygni	19 42.7	+32 28	10. —12	6 00.2	2 9	8 9	20 10	26 10				
WW Cygni	20 00.6	+41 18	9.3—13.4	3 07.6	3 5	9 21	23 3	29 18				
SW Cygni	03.8	+46 01	9. —11.7	4 13.8	4 0	13 3	17 17	26 21				
VW Cygni	11.4	+34 12	9.8—11.8	8 10.3	4 20	13 7	21 17	30 3				
RW Capric.	12.2	—17 59	8.8—10.6	3 09.4	4 2	10 21	17 16	24 10				
UW Cygni	19.6	+42 55	10.5—13	3 10.8	5 9	12 6	19 4	26 1				
V Vulpec.	32.3	+26 15	8.2— 9.8	37 19.0	6 8							
W Delphini	33.1	+17 56	9.4—12.1	4 19.4	3 10	13 1	17 20	27 11				
RR Delphini	38 9	+13 35	10.5—11.8	4 14.4	3 11	12 16	21 21					
Y Cygni	48.1	+34 17	7.1— 7.9	1 12.0	3 7	12 7	21 6	30 6				
WZ Cygni	49.3	+38 27	9.9—10.8	0 14.0	6 21	14 11	22 1	29 16				
RR Vulpec.	20 50.5	+27 32	9.6—11.0	5 01.2	1 1	11 4	21 6					
RY Aquarii	21 14.8	—11 14	8.8—10.4	1 23.2	5 11	13 8	21 5	29 1				
UZ Cygni	55.2	+43 52	8.9—11.6	31 07.3				28 21				
RT Lacertæ	21 57.4	+43 24	9.1—10.5	5 01.7	3 4	13 7	18 9	28 13				
RW Lacertæ	22 40.6	+49 08	10.2—11.2	5 04.4	4 3	14 12	19 17	30 1				
VW Pegasi	51.7	+32 42	10.0—10.6	5 06.4	5 16	10 23	21 12	26 18				
Y Piscium	23 29.3	+ 7 22	9.0—12.0	3 18.4	4 23	12 12	20 1	27 13				
TW Androm.	23 58.2	+32 17	8.6—11.5	4 02.9	5 21	14 2	22 9	30 15				

New Variable 118, 1925 in Pegasus. — In *Astronomische Nachrichten*, No. 5418, Mr. S. Blazko, of Moscow, Russia, announces a new variable star, discovered by Mme. L. Ceraski. The star is BD +10°4870 ($9^M.2$) and appears to vary approximately between magnitudes 8.5 and 10.5, in a period of about 197 days. Estimates of its brightness were made on 20 photographic plates obtained between 1909 and 1915. The position of the star is

$$\alpha = 22^h\,55^m\,55^s.1; \quad \delta = +10°\,34'.8\ (1855.0)$$
$$22^h\,58^m\,10^s.47 \qquad 10°\,49'\,14''.8\ (1900.0)$$

Monthly Report of the American Association of Variable Star Observers, January, 1926.

After a protracted silence, we are pleased to welcome to our observing ranks such splendid observers as Messrs. Nakamura, Marshall and MacPherson. It is of interest to note that observations reached us from China, Japan, India, South Africa and Australia, not forgetting England and continental Europe. This indicates an ever increasing interest in our work, which is now in the fifteenth year of its activities.

The 5-inch Jewett telescope has been loaned to Mr. E. W. Clement of Nashua, N. H., who formerly did such excellent work for us when he used a four-inch glass at Hudson, N. H. Several instruments, ranging in size from 3 to 5 inches, are available for loan to our deserving members, and application should be made promptly to the Telescope Committee, care of Harvard Observatory, Cambridge, Mass.

Along the lines hinted at in the recent monthly report, it is well to point out some features concerning the completeness and non-completeness with which the different variables are now being observed. Take the present report as an example. Of the 317 long period variables for which observations are printed herewith, 29 per cent were observed on only one night; 26 per cent on only two nights, and 14 per cent on three nights; while 10 per cent were observed on 10 or more nights. This is a mean of about 4 observations per star, which is complete enough for an average, if this average number could be more closely adhered to for more of the stars in question. Barring Mira Ceti, which is always of interest, especially when at maximum, too frequent observations of such stars as U Orionis, R Arietis, S Can. Min., S Ursa Maj., R Cygni and T Cephei could very well be dispensed with, especially when we note that these very same stars are also being almost as thoroughly observed by our French and British Variable Star Observers.

The above remarks do not, of course, apply to many of the irregular variables, such as R Cor. Bor., T Orionis, SS Cygni and SS Aurigae. These should be observed on every clear night, if we are to follow their variations as closely as necessary, and for stars of the SS Cygni type, observations should be made in as widely distributed longitudes as possible, in order that we may know just what form the curves take from night to night.

Although it is difficult to regulate the distribution of the observations to a nicety, due to unforeseen and uncontrolled conditions, one can readily see that it is hardly necessary to observe a long period variable, unless it is acting in a peculiar manner, for six or ten nights in succession.

VARIABLE STAR OBSERVATIONS RECEIVED DURING JANUARY, 1926.

Nov. 0 = J. D. 2424455; Dec. 0 = J. D. 2424485; Jan. 0 = J. D. 2424516.

Star	J.D.	Est.	Obs.	J.D.	Est.	Obs.
000339 V SCULPTORIS—						
	4460.0	[13.3	Bl			
001032 S SCULPTORIS—						
	4456.9	7.0	Bl	4493.9	7.3	Kd
	4458.3	7.4	Sm	4494.4	7.4	Sm
	4461.3	7.3	Ht	4495.3	7.3	Ht
	4468.0	6.8	Bl	4498.9	7.3	Kd
	4468.3	6.8	Ht	4499.3	7.5	Ht
	4475.3	7.0	Ht	4502.4	7.6	Sm
	4484.0	7.1	Bl	4504.0	7.6	Kd
	4486.9	7.0	Kd	4506.3	7.9	Ht
	4490.9	7.2	Kd	4507.4	7.6	Sm
001046 X ANDROMEDAE—						
	4502.7	12.2	Bi	4523.6	12.3	Lv
	4521.5	12.7	B			
001620 T CETI—						
	4486.9	6.3	Kd	4493.9	6.3	Kd
	4487.2	6.2	L	4498.9	6.3	Kd
	4488.9	6.3	Kd	4499.2	5.6	L
	4490.9	6.2	Kd	4500.9	6.3	Kd
001726 T ANDROMEDAE—						
	4502.6	12.7	Bi	4523.6	13.6	Lv
	4521.6	13.3	B			
001755 T CASSIOPEIAE—						
	4491.3	8.4	L	4518.5	8.2	Pt
	4499.2	8.7	L	4522.6	7.8	Jo
	4504.7	9.0	Bx	4523.6	8.8	Bx
	4504.7	9.0	Gs	4532.6	7.7	Jo
	4511.5	8.0	B	4535.5	7.9	Ya
	4519.6	7.9	Al	4535.6	7.8	Jo
001838 R ANDROMEDAE—						
	4446.9	12.0	Kk	4530.7	[12.4	Cy
001862 S TUCANAE—						
	4460.0	[13.5	Bl	4503.4	[13.2	Sm
001909 S CETI—						
	4487.2	12.2	L	4503.2	12.8	L
002546 T PHOENICIS—						
	4456.9	10.9	Bl	4492.3	10.6	Sm
	4458.3	10.0	Sm	4495.4	10.8	Sm
	4468.0	10.5	Bl	4502.4	11.1	Sm
	4484.0	10.5	Bl	4507.3	11.2	Sm
002833 W SCULPTORIS—						
	4460.0	13.0	Bl			
003179 Y CEPHEI—						
	4509.6	9.4	B			
004047 U CASSIOPEIAE—						
	4518.5	13.7	Pt	4522.6	13.5	Bi
004132 RW ANDROMEDAE—						
	4517.6	[12.5	B			
004435 X SCULPTORIS—						
	4457.0	10.6	Bl	4484.0	11.5	Bl
	4469.9	11.5	Bl			
004435 V ANDROMEDAE—						
	4502.6	12.6	Bi	4522.6	13.5	Bi
	4511.5	12.6	B	4530.5	13.7	B
004533 RR ANDROMEDAE—						
	4521.6	[13.2	B			
004746a RV CASSIOPEIAE—						
	4509.6	13.0	B	4530.5	14.2	B
	4518.5	13.1	Pt			
004746b — CASSIOPEIAE—						
	4518.5	10.9	Pt	4532.5	10.6	Ie
004958 W CASSIOPEIAE—						
	4509.6	10.8	B	4520.4	11.6	Lp
	4518.5	11.5	Pt	4530.5	11.2	B
005475 U TUCANAE—						
	4460.0	14.3	Bl	4502.9	12.9	Sm
	4492.3	[12.9	Sm			
005840 RX ANDROMEDAE—						
	4516.5	11.4	Pt	4529.6	11.0	Cu
	4517.5	11.5	Pt	4531.5	[12.4	Pt
	4518.3	13.0	Pt	4532.5	12.6	Pt
	4523.5	[12.6	Pt	4535.6	13.3	Cu
	4526.5	[12.4	Cu	4536.7	[12.4	Cu
	4528.5	10.8	Pt	4538.7	[12.5	Cu
	4528.6	11.01	Cu			
010102 Z CETI—						
	4518.5	11.0	Pt			
010630 U SCULPTORIS—						
	4457.0	11.7	Bl	4484.0	12.0	Bl
	4469.9	11.9	Bl			
010940 U ANDROMEDAE—						
	4511.6	[13.3	B	4517.6	13.2	B
011041 UZ ANDROMEDAE—						
	4521.6	13.3	B			
011208 S PISCIUM—						
	4521.6	9.1	B			
011272 S CASSIOPEIAE—						
	4523.5	13.5	Pt	4530.5	[13.3	B
012233a R SCULPTORIS—						
	4493.9	8.3	Kd			
012350 RZ PERSEI—						
	4511.6	10.2	B	4530.5	10.2	B
012502 R PISCIUM—						
	4500.2	[11.4	Ch	4522.6	11.9	Bi
013238 RU ANDROMEDAE—						
	4498.2	11.0	Ch	4523.5	11.4	Cu
	4509.6	11.2	B	4523.5	11.0	Pt
013338 Y ANDROMEDAE—						
	4498.2	11.4	Ch	4523.5	8.47	Cu
	4509.6	10.5	B	4525.5	8.64	Cu
	4523.5	8.5	Pt			
014958 X CASSIOPEIAE—						
	4509.6	10.2	B	4523.5	11.1	Pt
015354 U PERSEI—						
	4445.0	9.5	Kk	4503.2	9.0	Ch
	4450.9	9.4	Kk	4511.6	9.3	B
	4494.1	8.8	Kk	4523.5	9.2	Pt
	4498.9	8.6	Kk			
015912 S ARIETIS—						
	4523.5	13.8	Pt			
021024 R ARIETIS—						
	4491.0	7.6	Ch	4522.6	8.6	Jo
	4495.7	8.8	Mb	4522.6	8.6	Bi
	4497.9	7.7	Wb	4523.5	8.7	Pt
	4499.0	7.5	Ls	4523.6	8.5	Ly
	4500.0	7.6	Ls	4525.7	9.2	Gb
	4501.0	7.3	Ls	4530.7	9.8	Cy
	4503.2	7.9	Ch	4532.6	9.0	Jo
	4504.0	7.3	Ls	4534.7	9.3	Wb

VARIABLE STAR OBSERVATIONS RECEIVED DURING JANUARY, 1926—Continued.

Star	J.D.	Est.	Obs.	J.D.	Est.	Obs.
021024 R ARIETIS—Continued.						
	4505.0	7.8	Ls	4534.6	9.7	Mb
	4518.6	8.5	B	4535.6	9.5	Jo
	4520.4	9.1	Lp			
021143a W ANDROMEDAE—						
	4491.0	9.3	Ch	4503.0	8.3	Nk
	4495.0	8.1	Nk	4503.2	8.0	Ch
	4497.9	8.3	Nk	4506.0	8.0	Nk
	4499.9	8.4	Nk	4518.6	7.8	B
	4500.9	8.4	Nk	4523.5	7.5	Pt
	4502.0	8.5	Nk			
021258 T PERSEI—						
	4491.1	9.0	Ch	4523.5	8.5	Pt
	4503.2	9.2	Ch			
021403 o CETI—						
	4458.3	3.8	Sm	4499.0	3.9	Kd
	4462.3	3.7	Sm	4499.1	3.4	Ch
	4464.4	3.6	Sm	4499.2	3.3	L
	4473.1	3.6	Ch	4500.0	3.7	Kd
	4474.9	3.6	Ch	4500.0	3.7	Nk
	4476.8	3.6	Mp	4500.3	3.6	Sm
	4477.1	3.4	Ik	4500.9	3.7	Kd
	4478.0	3.3	Ik	4500.9	3.8	Nk
	4481.0	3.2	Ik	4501.0	3.8	Ik
	4483.1	3.5	Ch	4502.0	3.8	Ik
	4484.0	3.3	Ik	4502.0	3.7	Nk
	4486.9	3.4	Kd	4502.4	3.6	Sm
	4487.0	3.2	Ik	4503.0	3.6	Ik
	4487.7	3.0	Mp	4503.0	3.8	Nk
	4487.9	3.3	Kd	4503.2	3.5	Ch
	4488.0	3.2	Ik	4503.6	3.6	Cy
	4488.1	3.5	Ch	4503.7	3.6	Mp
	4488.8	3.6	Mp	4504.0	3.7	Kd
	4488.9	3.5	Kd	4504.7	3.6	Mp
	4489.3	3.4	Sm	4506.0	3.9	Kd
	4489.8	3.6	Mp	4506 0	3 9	Nk
	4490.9	3.5	Kd	4507.3	3.6	Sm
	4491.0	3.8	Ik	4508.5	3.9	Cy
	4491.3	3.0	L	4511.2	3.4	L
	4492.0	3.7	Nk	4514.3	3 6	Sm
	4492.0	3.8	Ik	4517.7	3.6	Mp
	4492.2	3.3	Ch	4519.6	3.7	Jo
	4493.0	3.6	Ik	4520.4	3.6	Lp
	4493.7	3.5	Mp	4522 6	4.0	Cy
	4493.9	3.3	Kd	4522.6	4.0	Jo
	4494.0	3.6	Ik	4523.5	4.4	Ie
	4494.3	3.4	Sm	4523.5	3.8	Pt
	4494.7	3.5	Mb	4523.6	4 5	Ya
	4495.0	3.5	Nk	4523.6	3.8	Pt
	4495.7	3.5	Kd	4523.6	4.2	Ly
	4496.0	3.8	Kd	4525.7	4.0	Gs
	4496.0	3.8	Ik	4526.3	4.2	Ly
	4496.2	3.4	Ch	4530.6	3.9	Cy
	4496.7	3.5	Mp	4531.6	4.07	Cu
	4497.0	3.5	Kd	4531.6	4.0	Cy
	4497.0	3.9	Ik	4532.5	4 5	Ly
	4497.0	3.6	Nk	4532.6	4.4	Jo
	4497.9	3.8	Nk	4534.7	4.2	Mb
	4498.0	3.9	Kd	4535.5	5.5	Al
	4498.9	3.6	Kd	4535.6	4.6	Jo
021558 S PERSEI—						
	4491.1	10.1	Ch	4517.6	9.4	B
	4503.2	9.7	Ch	4520.4	9.5	Lp
	4504.2	10.2	Kl	4523.5	9.8	Pt
022000 R CETI—						
	4500.2	11.6	Ch	4535.6	8 3	Ya
022426 R FORNACIS—						
	4457.0	9.5	Bl	4484.0	9.5	Bl
	4469.9	10.0	Bl			
022813 U CETI—						
	4500.2	10.8	Ch	4535.6	8.4	Ya
	4523.5	8.3	Pt			
023133 R TRIANGULI—						
	4469.0	8.7	Ls	4504.0	10.4	Ls
	4491.0	9.8	Ch	4505.0	10.4	Ls
	4493.0	9.9	Ls	4518.6	10.9	B
	4494.0	9.9	Ls	4522.6	10.7	Bi
	4496.0	9.9	Ls	4523.5	11.2	Pt
	4499.0	10.2	Ls	4530.7	11.4	Cy
	4500.0	10.2	Ls	4532.7	9.8	Jo
	4501.0	10.3	Ls	4535.5	11.0	Ya
024217 T ARIETIS—						
	4497.0	8.7	Nk	4500.9	8.7	Nk
	4498.0	8.7	Nk	4502.0	8.7	Nk
	4499.9	8.7	Nk	4508.0	8.7	Nk
024356 W PERSEI—						
	4485.9	9.1	Nk	4504.0	9.2	Nk
	4491.0	9.1	Nk	4503.2	9.4	Ch
	4492.0	9.1	Nk	4505.0	9.2	Nk
	4493.0	9.1	Nk	4506.0	9.2	Nk
	4495.0	9.1	Nk	4518.6	9.1	B
	4497.0	9.2	Nk	4522.6	9.4	Cy
	4497.9	9.2	Nk	4523.5	9.1	Pt
	4499.9	9.2	Nk	4525.7	9.0	Gs
	4501.0	9.1	Nk	4530.7	9.4	Cy
	4502.0	9.1	Nk	4535.5	9.0	Ya
	4503.0	9.2	Nk			
025050 R HOROLOGII—						
	4457.0	5.7	Bl	4484.0	6.3	Bl
	4458.3	6.1	Sm	4485.3	6.8	Ht
	4461.3	6.1	Ht	4495.3	7.1	Ht
	4468 3	6.4	Ht	4499.3	7.1	Ht
	4469.9	5.8	Bl	4503.4	7.1	Sm
	4475.3	6.1	Ht	4506.3	7.6	Ht
025751 T HOROLOGII—						
	4460.0	12.4	Bl	4503.4	12.7	Sm
	4462.3	12.5	Sm			
031401 X CETI—						
	4492.4	9.9	L	4523.5	9 4	Pt
	4503.2	9.8	L	4535.6	9.3	Jo
	4519.6	9.5	Jo			
032043 Y PERSEI—						
	4491.0	8.3	Nk	4503.0	8.9	Nk
	4495.0	8.3	Nk	4504.0	9.0	Nk
	4497.0	8.6	Nk	4506.0	8.8	Nk
	4497.9	8.8	Nk	4523.5	8.0	Pt
	4500.0	8.8	Nk	4532.5	9.0	Ya
	4501.0	8.8	Nk	4532.7	9.0	Gb
	4502.0	8.8	Nk			

VARIABLE STAR OBSERVATIONS RECEIVED DURING JANUARY, 1926—Continued.

Star	J.C.D.	Est.	Obs.	J.C.D.	Est.	Obs.
032335 R PERSEI—						
	4520.4	10.8	Lp	4523.5	10.4	Pt
041619 T TAURI—						
	4526.6	10.2	Cu	4528.6	10.6	Cu
042209 R TAURI—						
	4504.7	[11.0	Bx	4532.6	11.0	Ie
042215 W TAURI—						
	4523.5	11.4	Pt	4530.7	11.3	Cv
	4525.7	12.2	Gs	4531.8	10.8	Mh
	4528.5	11.0	Mh	4532.6	10.0	Jo
042309 S TAURI—						
	4494.1	[10.6	Ch			
043065 T CAMELOPARDALIS—						
	4490.2	12.9	L	4523.5	12.5	Pt
	4503.2	13.4	L			
043208 RX TAURI—						
	4504.6	12.5	B	4522.6	10.7	Bi
	4520.5	11.3	B	4523.5	11.0	Pt
043263 R RETICULI—						
	4457.0	9.1	Bl	4485.3	10.4	Ht
	4458.3	8.7	Sm	4495.3	11.4	Sm
	4461.3	9.3	Ht	4495.3	11.4	Ht
	4468.3	9.8	Ht	4499.3	11.2	Ht
	4469.9	10.0	Bl	4504.3	11.7	Sm
	4475.3	10.1	Ht	4506.3	11.7	Ht
	4484.0	10.5	Bl			
043274 X CAMELOPARDALIS—						
	4523.5	8.6	Pt	4531.7	8.2	Ch
043562 R DORADUS—						
	4457.0	5.5	Bl	4485.3	5.8	Ht
	4458.3	5.6	Sm	4495.3	5.8	Sm
	4461.3	5.5	Ht	4495.3	5.5	Ht
	4468.3	5.8	Ht	4499.3	5.8	Ht
	4469.4	5.5	Bl	4504.3	5.8	Sm
	4475.3	5.5	Ht	4506.3	5.8	Ht
	4484.0	5.5	Bl			
043738 R CAELI—						
	4462.3	[12.0	Sm	4503.3	[12.0	Sm
	4495.3	[12.0	Ht	4506.3	[11.7	Ht
044349 R PICTORIS—						
	4457.0	7.2	Bl	4484.0	7.9	Bl
	4469.9	7.4	Bl			
044617 V TAURI—						
	4502.1	[11.5	Ch	4530.5	12.4	B
045307 R ORIONIS—						
	4523.6	11.4	Ie			
045514 R LEPORIS—						
	4449.1	10.3	Kk	4517.6	8.2	B
	4471.2	9.9	Kk	4523.5	7.9	Pt
	4473.2	10.4	Kk	4523.6	10.0	Ly
	4476.2	10.2	Kk	4525.6	8.6	Jo
	4492.4	8.8	L	4528.5	7.5	Al
	4493.2	10.1	Kk	4532.6	9.5	Ly
	4497.1	9.4	Ch	4532.6	8.0	Jo
	4499.1	9.9	Kk	4535.6	7.8	Jo
050003 V ORIONIS—						
	4497.1	[12.3	Ch	4523.5	[12.7	Ie
	4520.5	13.6	B	4523.5	13.0	Pt
050022 T LEPORIS—						
	4457.0	10.2	Bl	4508.6	7.9	B
	4469.9	10.4	Bl	4523.5	8.1	Pt
	4484.0	8.9	Bl			
050848 S PICTORIS—						
	4458.3	[12.2	Sm	4494.3	[12.9	Sm
	4460.0	[13.4	Bl	4503.3	[12.9	Sm
050953 R AURIGAE—						
	4502.1	11.8	Ch	4522.6	12.9	Bi
	4504.7	11.5	Bx	4523.5	12.8	Pt
051247 T PICTORIS—						
	4457.0	8.7	Bl	4484.0	10.2	Bl
	4458.3	8.8	Sm	4494.3	12.5	Sm
	4461.3	9.0	Ht	4495.3	11.8	Ht
	4468.3	9.2	Ht	4499.3	12.1	Ht
	4469.9	8.8	Bl	4503.3	12.5	Sm
	4475.3	10.0	Ht	4506.3	[12.5	Ht
051533 T COLUMBAE—						
	4457.0	11.6	Bl	4489.4	11.2	Sm
	4461.3	11.6	Ht	4494.3	11.0	Sm
	4462.3	12.2	Sm	4495.3	11.0	Ht
	4468.3	11.6	Ht	4499.3	10.8	Ht
	4469.9	11.8	Bl	4501.3	9.7	Sm
	4475.3	11.6	Ht	4506.3	9.5	Sm
	4484.0	11.2	Bl	4506.3	10.2	Ht
052034 S AURIGAE—						
	4492.2	9.2	Ch	4523.5	8.1	Pt
	4508.5	8.8	B	4535.6	8.9	Ya
052036 W AURIGAE—						
	4492.2	11.4	Ch	4523.5	9.2	Pt
	4508.5	9.6	B			
052404 S ORIONIS—						
	4508.5	9.4	B	4523.5	9.0	Pt
053005 T ORIONIS—						
	4448.2	9.8	Kk	4503.0	9.7	Kk
	4449.2	9.9	Kk	4504.6	10.2	B
	4451.1	9.7	Kk	4504.9	9.7	Kk
	4471.1	9.9	Kk	4506.0	11.0	Nk
	4473.1	9.7	Kk	4511.7	10.7	Pt
	4476.1	9.6	Kk	4512.5	10.8	Pt
	4488.9	9.7	Kk	4515.5	10.7	Pt
	4491.6	10.0	L	4517.5	11.0	B
	4492.0	11.0	Nk	4517.5	10.5	Pt
	4492.4	10.0	L	4518.5	10.9	Pt
	4493.0	10.7	Nk	4523.5	10.5	Pt
	4493.1	9.8	Kk	4526.6	11.3	Cu
	4494.0	10.7	Nk	4527.5	11.1	B
	4494.1	9.7	Kk	4528.5	10.7	Pt
	4498.0	10.3	Nk	4528.6	10.6	Cu
	4499.0	9.7	Kk	4529.6	10.2	Cu
	4501.0	10.5	Nk	4529.8	10.6	Pt
	4501.9	10.4	Nk	4531.5	10.4	Pt
	4503.0	10.6	Nk	4532.5	10.4	Pt
053068 S CAMELOPARDALIS—						
	4523.5	10.2	Pt			
053326 RR TAURI—						
	4504.5	13.0	B	4520.5	13.2	B
053337 RU AURIGAE—						
	4523.5	[12.0	Pt			

VARIABLE STAR OBSERVATIONS RECEIVED DURING JANUARY, 1926—Continued.

Star	J.C.D.	Est.	Obs.	J.C.D.	Est.	Obs.
053531 U AURIGAE—						
	4492.2	11.2	Ch	4523.5	11.5	Pt
	4504.6	11.3	B			
053920 Y TAURI—						
	4498.3	7.0	Kl	4503.4	7.2	Kl
	4500.2	7.0	Kl			
054319 SU TAURI—						
	4490.6	10.3	Ch	4523.5	[12.9	Ie
	4492.2	10.3	Ch	4526.6	[12.3	Cu
	4497.1	10.5	Ch	4528.8	13.5	Pt
	4502.2	11.9	Ch	4529.8	[12.1	Pt
	4511.5	[12.5	B	4530.5	[13.5	B
	4511.7	12.3	Pt	4531.9	[13.2	Cu
	4512.5	[12.1	Pt	4532.6	[12.9	Ie
	4515.5	[11.5	Pt	4532.7	[12.9	Cu
	4516.5	[12.1	Pt	4535.6	[13.2	Cu
	4517.5	[13.5	B	4536.7	[12.9	Cu
	4518.5	[12.1	Pt	4538.7	[12.9	Cu
	4520.5	[13.5	B			
054331 S COLUMBAE—						
	4460.0	13.1	Bl	4495.3	[12.6	Ht
	4489.4	[12.6	Sm	4502.3	13.0	Sm
	4494.3	13.1	Sm	4506.3	[12.2	Ht
054615a Z TAURI—						
	4532.6	14.0	Ie			
054615c RU TAURI—						
	4532.6	14.2	Ie			
054629 R COLUMBAE—						
	4460.0	[13.0	Bl	4489.4	[13.0	Sm
	4462.3	[12.4	Sm	4494.3	[13.0	Sm
054920a U ORIONIS—						
	4438.1	8.8	Kk	4502.2	10.1	Ch
	4448.2	8.8	Kk	4503.0	9.2	Nk
	4449.2	8.9	Kk	4506.0	9.5	Nk
	4473.2	9.8	Kk	4508.6	9.4	B
	4476.1	9.9	Kk	4520.4	10.6	Lp
	4491.0	9.0	Nk	4522.6	9.2	Jo
	4492.0	9.4	Nk	4522.6	10.4	Cy
	4492.2	9.8	Ch	4522.6	10.2	Bi
	4493 0	9.5	Nk	4523.5	10.2	Pt
	4495.0	9.5	Nk	4528.5	10.2	Al
	4497.0	9.0	Nk	4531.6	10.4	Cy
	4498.0	9.5	Nk	4534.6	8.7	Mb
	4500.9	9.2	Nk	4535.6	9.9	Jo
	4501.9	9.2	Nk			
054920b UW ORIONIS—						
	4522.6	10.6	Bi	4531.6	10.5	Cy
	4522.6	10.6	Cy			
054974 V CAMELOPARDALIS—						
	4504.6	11.1	B	4530.6	9.8	Ie
	4517.5	10.2	B			
055353 Z AURIGAE—						
	4489.1	9.9	Ch	4526.8	10.9	Cu
	4504.6	10.1	B	4527.5	10.5	B
	4511.7	10.2	Pt	4528.5	10.7	Pt
	4516.5	10.0	Pt	4529.8	10.6	Pt
	4517.5	10.3	Pt	4531.5	10.8	Pt
	4517.5	10.5	B	4532.5	10.8	Pt
	4523.5	10.5	Pt	4532.6	10.9	Ya
055686 R OCTANTIS—						
	4460.0	11.7	Bl	4484.0	11.2	Bl
	4462.4	11.5	Sm	4494.3	11.0	Sm
	4469.9	11.6	Bl	4503.3	11.1	Sm
060450 X AURIGAE—						
	4488.1	11.6	Ch	4520.5	11.6	B
	4490.1	11.7	Ch	4523.7	11.6	Pt
060547 SS AURIGAE—						
	4480.2	10.9	Ch	4518.6	11.2	B
	4488.1	[11.6	Ch	4520.4	12.0	Lp
	4489.1	[11.6	Ch	4520.5	12.0	B
	4490.1	[11.6	Ch	4521.5	12.8	B
	4492.1	[12.4	Ch	4522.5	13.6	Ie
	4493.2	[13.5	L	4522.8	13.82	Cu
	4496.3	[12.6	Lp	4523.5	14.0	Ie
	4498.2	[11.8	Ch	4523.6	13.9	Cu
	4502.2	[13.0	L	4523.7	14.0	Bi
	4503.6	[13.0	Cy	4526.5	[12.6	Cu
	4504 6	[13.8	B	4527.5	[13.8	B
	4509.5	[11.6	Ch	4528.8	14.8	Du
	4511.5	[12.6	Ie	4529.8	[12.6	Pt
	4513.5	[11.4	Ie	4530.5	[13.7	B
	4514.5	[11.4	Ie	4531.8	[14.0	Cu
	4515.5	[12 4	Pt	4532.8	[14.0	Cu
	4516.5	[11.8	Pt	4535.6	[14.0	Cu
	4517.5	11.2	Pt	4536.7	[14.0	Cu
	4517.5	11.3	B	4538.7	[14.0	Cu
	4518.5	10.9	Pt			
061647 V AURIGAE—						
	4526.8	12.2	Cu	4527.5	11.9	B
061702 V MONOCEROTIS—						
	4497.2	9.8	Ch	4526.7	8.35	Cu
	4523.7	8.3	Pt	4535.6	8.2	Ya
063308 R MONOCEROTIS—						
	4509.6	11.8	B	4523.7	10.5	Pt
063462 NOVA PICTORIS, 1925—						
	4456.0	4.2	Bl	4492.3	3.9	Sm
	4457.0	4.1	Bl	4494.4	4.5	Sm
	4458.3	4.4	Sm	4495.3	4.5	Ht
	4460.0	4.3	Bl	4495.4	4.5	Sm
	4461.0	4.3	Bl	4499.3	4.5	Sm
	4462.0	4.3	Bl	4500.4	4.5	Sm
	4462.3	4.4	Sm	4501.3	4.5	Sm
	4464.0	4.3	Bl	4501.3	4.6	Ht
	4468.0	4.2	Bl	4503.4	4.6	Sm
	4469.0	4.3	Bl	4504.4	4.6	Sm
	4470.0	4.4	Bl	4506.3	4.8	Ht
	4481.0	4.3	Bl	4507.3	4.7	Sm
	4484.0	4.4	Bl			
063558 S LYNCIS—						
	4499.2	10.5	Ch	4527.5	12.2	B
	4523.7	11.4	Pt			
064030 X GEMINORUM—						
	4511.6	8.5	B	4532.6	9.2	Ie
064707 W MONOCEROTIS—						
	4509.6	9.2	B	4523.7	10.2	Pt
065111 Y MONOCEROTIS—						
	4497.2	9.4	Ch	4523.7	10.7	Bi
	4511.6	9.5	B	4523.7	11.0	Pt

VARIABLE STAR OBSERVATIONS RECEIVED DURING JANUARY, 1926—Continued.

Star	J.C.D.	Est.	Obs.	J.C.D.	Est.	Obs.
065208 X MONOCEROTIS—						
	4491.6	9.0	L	4502.0	8.5	Nk
	4497.2	9.3	Ch	4535.6	7.6	Ya
065355 R LYNCIS—						
	4499.2	[11.2	Ch			
070109 V CANIS MINORIS—						
	4492.2	10.9	Ch	4523.6	12.4	Ie
	4503.2	11.6	Ch	4527.5	12.6	B
	4504.6	11.0	B	4530.6	12.6	B
070122a R GEMINORUM—						
	4497.2	6.8	Ch	4523.7	7.0	Pt
	4507.1	6.7	Ls	4528.5	7.7	Al
	4509.6	7.0	B	4532.7	7.5	Pw
	4523.7	7.1	Bi			
070122b Z GEMINORUM—						
	4509.6	12.3	B	4523.7	12.6	Pt
	4523.7	12.5	Bi			
070122c TW GEMINORUM—						
	4507.1	8.4	Ls	4523.7	8.1	Bi
	4509.6	8.0	B	4532.7	8.4	Pw
	4523.7	8.0	Pt			
070310 R CANIS MINORIS—						
	4491.7	7.9	L	4511.6	8.5	B
	4503.2	8.3	Ch			
070772 R VOLANTIS—						
	4462.3	[12.6	Sm	4495.3	12.6	Ht
	4475.3	[12.6	Ht	4501.3	12.6	Ht
	4492.3	13.0	Sm	4502.4	12.6	Sm
	4495.3	12.6	Sm	4506.3	12.3	Ht
071201 RR MONOCEROTIS—						
	4497.2	8.8	Ch	4523.7	9.4	Bi
071713 V GEMINORUM—						
	4511.5	9.3	B	4523.7	9.1	Pt
072708 S CANIS MINORIS—						
	4480.2	9.4	Ch	4507.1	9.0	Ls
	4491.7	8.8	L	4511.6	9.1	B
	4494.2	9.2	Kk	4523.6	8.6	Ie
	4497.2	8.7	Ch	4523.7	8.2	Pt
	4497.9	9.6	Wb	4525.6	8.5	Jo
	4499.2	9.0	Kk	4527.7	8.9	Wb
	4501.1	9.2	Ls	4528.5	8.6	Al
	4502.0	8.7	Nk	4528.6	9.0	Mh
	4503.2	8.6	Ch	4530.7	8.5	Cy
	4504.1	9.4	Ls	4532.6	8.1	Jo
	4505.1	9.4	Ls	4535.6	8.0	Jo
072811 T CANIS MINORIS—						
	4520.5	13.5	B			
073173 S VOLANTIS—						
	4460.0	11.8	Bl	4484.0	11.5	Bl
073508 U CANIS MINORIS—						
	4491.7	11.6	L	4528.5	10.4	Pt
	4509.7	10.4	B			
073723 S GEMINORUM—						
	4492.2	12.6	Ch	4528.5	10.1	Pt
	4500.2	12.2	Ch	4530.5	9.8	Ie
	4509.5	11.4	Ch	4532.7	9.6	Pw
	4511.6	10.7	B			
074241 W PUPPIS—						
	4462.4	8.9	Sm	4495.3	8.1	Ht
	4470.0	8.2	Bl	4499.3	8.5	Ht
	4485.3	7.9	Ht	4500.3	8.3	Sm
074241 W PUPPIS—Continued.						
	4489.3	8.0	Sm	4506.3	8.7	Sm
	4495.3	8.1	Sm	4506.3	9.0	Ht
074323 T GEMINORUM—						
	4492.2	9.9	Ch	4509.5	9.1	Ch
	4500.2	9.7	Ch	4528.5	8.9	Pt
	4508.6	9.1	B	4530.6	8.7	Ie
074922 U GEMINORUM—						
	4491.2	9.9	Ch	4523.6	[13.7	Ie
	4492.2	9.2	Ch	4523.7	14.0	Bi
	4493.2	9.2	Ch	4523.8	[13.7	Cu
	4497.2	10.5	Ch	4526.7	[13.3	Cu
	4498.2	11.1	Ch	4527.5	[13.8	B
	4499.2	12.5	Ch	4528.5	[12.4	Pt
	4500.2	[12.4	Ch	4528.8	14.0	Du
	4502.2	[12.4	Ch	4529.8	[13.3	Pt
	4503.2	[12.3	Ch	4530.6	14.0	B
	4503.6	[11.1	Cy	4531.6	[13.3	Cy
	4504.6	[13.8	B	4531.8	13.8	Cu
	4509.5	[12.4	Ch	4532.6	[13.7	Ie
	4511.6	[12.3	Ie	4532.8	13.9	Cu
	4517.5	[12.3	Pt	4535.9	[13.7	Cu
	4518.5	[11.3	Pt	4536.7	14.0	Cu
	4520.4	[12.9	Lp	4538.7	13.9	Cu
	4522.6	[13.3	Cy			
075612 U PUPPIS—						
	4497.2	[11.8	Ch	4530.6	11.7	B
	4527.5	11.9	B			
081112 R CANCRI—						
	4492.2	10.6	Ch	4531.6	9.2	Cy
	4500.2	10.5	Ch	4531.8	9.8	Mh
	4529.8	9.7	Pt	4532.7	10.0	Pw
081617 V CANCRI—						
	4492.2	9.4	Ch	4531.6	11.8	Cy
	4529.8	11.6	Pt			
082405 RT HYDRAE—						
	4529.8	8.0	Pt			
082476 R CHAMAELEONTIS—						
	4457.0	[12.6	Bl	4489.3	[12.4	Sm
	4462.3	[11.8	Sm	4502.4	[12.4	Sm
083019 U CANCRI—						
	4523.7	11.5	Bi	4527.6	11.7	B
083350 X URSAE MAJORIS—						
	4518.6	10.1	B	4529.8	9.6	Pt
084803 S HYDRAE—						
	4492.2	9.0	Ch	4529.8	11.0	Pt
	4503.2	9.5	Ch			
085008 T HYDRAE—						
	4529.8	12.8	Pt	4530.6	11.7	B
085120 T CANCRI—						
	4492.2	9.5	Ch	4529.8	8.7	Pt
090024 S PYXIDIS—						
	4529.8	12.0	Pt			
090151 V URSAE MAJORIS—						
	4492.0	10.3	Nk	4503.0	10.3	Nk
	4497.0	10.2	Nk	4506.0	10.3	Nk
	4498.0	10.2	Nk	4518.6	10.3	B
	4501.0	10.3	Nk	4526.0	10.51	Cu
	4502.0	10.2	Nk	4528.8	10.48	Cu

VARIABLE STAR OBSERVATIONS RECEIVED DURING JANUARY, 1926—Continued.

Star	J.C.D.	Est.	Obs.	J.C.D.	Est.	Obs.
090425 W CANCRI—						
	4531.7	[10.0	Pw			
092551 Y VELORUM—						
	4470.0	10.9	Bl	4503.8	11.5	Sm
	4494.4	11.3	Sm			
092962 R CARINAE—						
	4470.0	6.2	Bl	4499.3	8.0	Ht
	4485.3	6.8	Ht	4500.4	7.3	Sm
	4489.4	7.0	Sm	4506.3	8.0	Sm
	4494.3	7.0	Sm	4506.3	8.2	Ht
	4495.3	7.6	Ht			
093014 X HYDRAE—						
	4500.3	9.9	Ch	4529.8	8.2	Pt
093178 Y DRACONIS—						
	4530.6	13.6	Cy			
093934 R LEONIS MINORIS—						
	4529.8	10.8	Pt			
094211 R LEONIS—						
	4491.1	8.9	Ik	4529.8	6.7	Pt
	4492.2	8.8	Ch	4530.7	6.6	Cy
	4493.2	9.0	Kk	4531.7	7.0	Pw
	4499.1	8.9	Kk	4531.9	7.5	Mh
	4503.2	8.4	Ch	4532.7	7.0	Pw
	4525.7	7.6	Jo	4535.6	6.6	Jo
	4528.8	7.3	Wb			
094512 X LEONIS—						
	4526.8	12.3	Cu	4532 9	[12.3	Cu
	4528.8	12.3	Cu	4536.8	13.1	Cu
094622 Y HYDRAE—						
	4529.8	6.4	Pt			
094053 Z VELORUM—						
	4489.4	[12.8	Sm	4506.3	[12.1	Ht
	4502.3	[12.1	Sm			
095421 V LEONIS—						
	4523.7	13.5	Bi	4529.8	13.5	Pt
100661 S CARINAE—						
	4470 0	5.5	Bl	4500.3	6.5	Sm
	4489.4	6.3	Sm	4501.3	6.7	Ht
	4494.5	6.3	Sm	4506.3	6.8	Ht
	4495.3	6.5	Ht	4506.3	6.7	Sm
101058 Z CARINAE—						
	4470.0	11.2	Bl	4503.3	12.5	Sm
	4494.4	12.3	Sm			
101153 W VELORUM—						
	4470 0	8.4	Bl	4503.4	9.5	Sm
103212 U HYDRAE—						
	4491.7	4.9	L	4501.3	6.0	Kd
	4496.3	5.8	Kd	4508.4	5.4	Kd
103769 R URSAE MAJORIS—						
	4500.2	8.8	Ch	4531.7	10.0	Mh
	4522.7	9.4	Gb	4531.7	10.1	Cy
	4523.6	10.0	Ly	4532 6	10.1	Ly
	4529.8	9.5	Pt	4532.6	10.8	Ie
	4531.7	10.3	Pw			
104620 V HYDRAE—						
	4491.7	11.7	L	4529.8	10.6	Pt
	4509.5	11.8	Ch			
104814 W LEONIS—						
	4523.7	13.0	Bi			
110361 RS CARINAE—						
	4494.4	[12.3	Sm	4503.4	[12.3	Sm
111661 RS CENTAURI—						
	4470.0	12.0	Bl	4503.4	11.1	Sm
	4494.4	11.3	Sm			
120012 SU VIRGINIS—						
	4529.8	11.8	Pt			
121418 R CORVI—						
	4493.7	11.1	L	4529.8	13.5	Pt
122001 SS VIRGINIS—						
	4491.7	5.7	L	4501.3	7.9	Kd
122532 T CANUM VENATICORUM—						
	4529.8	9.7	Pt			
122803 Y VIRGINIS—						
	4491.7	12.4	L			
123160 T URSAE MAJORIS—						
	4529.8	12.8	Pt	4531.7	[12.4	Cy
123307 R VIRGINIS—						
	4529.8	6.7	Pt			
123459 RS URSAE MAJORIS—						
	4508.5	9.5	Ch	4530.7	10.0	Cy
	4522.6	9.3	Cy	4531.7	10.2	Mh
	4529.8	9.8	Pt			
123961 S URSAE MAJORIS—						
	4473.2	8.2	Kk	4510.2	8.5	Kl
	4476.2	7.8	Kk	4520.4	8.3	Lp
	4487.2	7.6	L	4522.7	8.6	Gb
	4494.2	8.1	Kk	4527.2	8.9	Kl
	4498.3	8.5	Kl	4527.9	8.7	Wb
	4499.2	8.3	Kk	4529 8	8.7	Pt
	4500.2	8.5	Kl	4531.7	9.1	Mh
	4503.4	8.6	Kl	4531.7	9.0	Cy
	4503.2	7.7	L	4532.7	8.8	Jo
	4504.3	8.2	Kk	4535.6	9.0	Jo
	4508 5	8.2	Ch			
124606 U VIRGINIS—						
	4529.8	9.0	Pt			
131283 Y OCTANTIS—						
	4459.9	12.9	Bl	4494.3	[12.9	Sm
	4462.3	[12.9	Sm	4503.4	13.0	Sm
132422 R HYDRAE—						
	4508.5	9.4	Ch	4529.8	8.5	Pt
132706 S VIRGINIS—						
	4508.5	[11.0	Ch	4531.9	[10.3	Mh
	4529.8	11.5	Pt			
133273 T URSAE MINORIS—						
	4535.0	9.2	Jo			
133633 T CENTAURI—						
	4493.3	7.0	Kd	4501.4	6.7	Kd
	4497.3	6.8	Kd	4508.4	6.4	Kd
134440 R CANUM VENATICORUM—						
	4509.4	9.0	Ch	4529.8	8.9	Pt
134677 T APODIS—						
	4459.9	12.6	Bl	4492.3	[12.7	Sm
	4462 3	12.7	Sm	4503.4	[12.7	Sm
140950 R CENTAURI—						
	4459.9	11.4	Bl			
141567 U URSAE MINORIS—						
	4509.5	7.6	Ch	4529.8	8.1	Pt
141954 S BOOTIS—						
	4508.5	[10.6	Ch	4529.8	12.7	Pt

VARIABLE STAR OBSERVATIONS RECEIVED DURING JANUARY, 1926—Continued.

Star	J.C.D.	Est.	Obs.	J.C.D.	Est.	Obs.
142539a V BOOTIS—						
	4491.6	8.0	L	4529.8	8.0	Pt
	4508.5	7.9	Ch			
142584 R CAMELOPARDALIS—						
	4522.4	10.3	Lp	4522.7	10.0	Gb
143227 R BOOTIS—						
	4508.5	[10.5	Ch	4529.8	12.3	Pt
145254 Y LUPI—						
	4459.9	[12.8	Bl			
145971 S APODIS—						
	4458.3	9.9	Sm	4468.0	10.0	Bl
150018 RT LIBRAE—						
	4529.8	13.6	Pt			
150605 Y LIBRAE—						
	4493.7	9.5	L	4529.8	11.9	Pt
151520 S LIBRAE—						
	4529.8	8.4	Pt			
151714 S SERPENTIS—						
	4529.8	12.8	Pt			
151731 S CORONAE BOREALIS—						
	4508.5	7.3	Ch	4529.8	7.4	Pt
152714 RU LIBRAE—						
	4529.8	9.8	Pt			
153378 S URSAE MINORIS—						
	4525.6	9.0	Du	4530.6	8.6	Cy
	4529.8	8.6	Pt	4531.7	8.7	Mh
154428 R CORONAE BOREALIS—						
	4491.3	6.0	Kd	4528.9	6.0	Cy
	4493.7	6.0	L	4528.9	6.0	Du
	4496.3	6.3	Kd	4529.8	6.1	Pt
	4504.9	6.0	Cy	4531.9	6.5	Gb
	4501 3	6.3	Kd	4531.9	6.5	Mh
	4508.4	6.2	Kd	4532.9	6.0	Cy
	4508.5	6.1	Ch	4533.9	6.0	Cy
	4515.9	6.2	Pt			
154536 X CORONAE BOREALIS—						
	4502.3	9.0	Kk	4504.3	8.9	Kk
154615 R SERPENTIS—						
	4502.3	9.0	Kk	4509.5	8.3	Ch
	4504 3	8.9	Kk	4529.8	7.0	Pt
154639 V CORONAE BOREALIS—						
	4529.8	7.9	Pt			
155823 RZ SCORPII—						
	4529.8	11.0	Pt			
160118 R HERCULIS—						
	4529.9	11.0	Pt			
160210 U SERPENTIS—						
	4529.9	9.9	Pt			
160325 SX HERCULIS—						
	4493.2	8.6	L	4529.9	8.5	Pt
	4515.9	9.0	Pt			
160625 RU HERCULIS—						
	4493.2	8.1	L	4529.9	9.2	Pt
161607 W OPHIUCHI—						
	4529.9	12.4	Pt			
162112 V OPHIUCHI—						
	4529.9	7.7	Pt			
162119 U HERCULIS—						
	4529.9	13.0	Pt			
162807 SS HERCULIS—						
	4493.7	9.6	L	4529.9	9.8	Pt
163137 W HERCULIS—						
	4508.5	[11.2	Ch	4529.9	11.2	Pt
163172 R URSAE MINORIS—						
	4496.3	9.4	Lp	4522.4	9.4	Lp
163266 R DRACONIS—						
	4520.4	11.2	Lp	4529.9	11.1	Pt
164715 S HERCULIS—						
	4529.9	9.9	Pt			
164844 RS SCORPII—						
	4458.3	[11.4	Sm	4459.9	11 8	Bl
165202 SS OPHIUCHI—						
	4529.9	8.5	Pt			
165631 RV HERCULIS—						
	4529.9	13.9	Pt			
165636 RT SCORPII—						
	4459.9	9.8	Bl	4468.0	10.3	Bl
170833 RW SCORPII—						
	4459.8	[12.5	Bl			
171401 Z OPHIUCHI—						
	4529.9	8.1	Pt			
171723 RS HERCULIS—						
	4529.9	8.6	Pt			
172486 S OCTANTIS—						
	4456.9	9.1	Bl	4484.0	10.2	Bl
	4461.3	9.7	Ht	4495.3	11.7	Ht
	4462.3	9.9	Sm	4499.3	11.8	Ht
	4468.0	9.5	Bl	4503.3	12.1	Sm
	4468.3	10.0	Ht	4506.3	12.1	Ht
	4475.3	10.0	Ht			
173543 RU SCORPII—						
	4468.0	8.7	Bl	4483.9	9.3	Bl
174135 SV SCORPII—						
	4468.0	10.0	Bl	4483.9	9.6	Bl
174162 W PAVONIS—						
	4459.9	[13.0	Bl	4485.3	11.0	Ht
174551 U ARAE—						
	4458.3	[12.3	Sm			
175519 RY HERCULIS—						
	4491.0	[11.0	Ch	4529.9	13.5	Pt
175654 V DRACONIS—						
	4529.9	14.4	Pt			
180363 R PAVONIS—						
	4458.3	12.9	Sm	4475.3	12.5	Ht
	4468.3	12.5	Ht	4492.3	11.1	Sm
180531 T HERCULIS—						
	4491.0	8.3	Ch	4511.2	7.7	L
	4493.2	8 3	L	4529.9	8.0	Pt
	4496.3	8.0	Lp	4530.9	7.3	Gb
	4503.2	7.5	L			
180565 W DRACONIS—						
	4529.9	8.9	Pt			
181031 TV HERCULIS—						
	4490.2	[14.0	L	4503.2	11.2	L
	4493.2	13.0	L			
181136 W LYRAE—						
	4446.9	8.2	Kk	4500.0	11.1	Nk
	4450.9	9.4	Kk	4502.2	11.7	L
	4453.9	9.4	Kk	4517.5	12.5	Pt
	4493.2	11.3	L			
182133 RV SAGITTARII—						
	4468.0	11.5	Bl	4483.9	10.6	Bl

VARIABLE STAR OBSERVATIONS RECEIVED DURING JANUARY, 1926—Continued.

Star	J.C.D.	Est.	Obs.	J.C.D.	Est.	Obs.
182224 SV HERCULIS—						
	4493.2	14.2	L			
183308 X OPHIUCHI—						
	4493.0	6.4	Ch	4503.4	7.0	Cy
	4493.2	6.6	L	4511.2	7.1	L
	4499.2	6.7	L			
184134 RY LYRAE—						
	4517.5	11.4	Pt			
184205 R SCUTI—						
	4487.9	6.4	Kd	4499.2	5.4	L
	4490.0	5.8	Ch	4502.9	5.6	Kd
	4490.2	5.3	L	4503.2	5.3	L
	4493.9	5.9	Kd	4503.4	5.5	Cv
	4495.9	5.7	Kd	4503.9	5.5	Kd
184300 NOVA AQUILAE, 1918—						
	4490.0	10.4	Ch			
185032 RX LYRAE—						
	4489.0	11.0	Ch			
185437a S CORONAE AUSTRALIS—						
	4468.0	12.5	Bl			
185537a R CORONAE AUSTRALIS—						
	4468.0	12.0	Bl	4483.9	11.6	Bl
185634 Z LYRAE—						
	4517.5	11.8	Pt			
185737 RT LYRAE—						
	4489.0	10.7	Ch			
190108 R AQUILAE—						
	4490.0	5.9	Ch	4496.3	5.8	Lp
190818 RX SAGITTARII—						
	4490.0	10.6	Ch			
190810a RW SAGITTARII—						
	4490.0	10.5	Ch			
190925 S LYRAE—						
	4486.1	[12.4	Ch			
190926 X LYRAE—						
	4535.5	8.8	Pt			
190933a RS LYRAE—						
	4489.0	[11.8	Ch	4517.5	12.8	Pt
190941 RU LYRAE—						
	4517.5	11.7	Pt			
190967a U DRACONIS—						
	4491.0	[10.9	Ch	4517.5	13.9	Pt
191007 W AQUILAE—						
	4493.0	10.4	Ch			
191017 T SAGITTARII—						
	4490.0	11.5	Ch			
191019 R SAGITTARII—						
	4490.0	10.1	Ch			
191033 RY SAGITTARII—						
	4458.3	7.0	Sm	4468.0	6.2	Bl
	4462.3	6.9	Sm	4483.9	6.3	Bl
191124 TY SAGITTARII—						
	4468.0	10.4	Bl	4483.9	11.4	Bl
191319 S SAGITTARII—						
	4460.0	[12.9	Bl			
191331 SW SAGITTARII—						
	4468.0	10.1	Bl	4483.9	10.7	Bl
191350 TZ CYGNI—						
	4517.5	11.0	Pt			
191637 U LYRAE—						
	4517.5	11.2	Pt			
192928 TY CYGNI—						
	4498.1	[11.9	Ch	4517.5	12.8	Pt
193311 RT AQUILAE—						
	4489.1	[11.7	Ch			
193449 R CYGNI—						
	4482.7	6.6	Wb	4501.9	8.3	Nk
	4485.9	7.3	Nk	4503.5	8.2	Cy
	4488.1	6.7	Ch	4504.6	8.5	Gs
	4490.0	7.0	Ch	4504.9	8.5	Nk
	4492.0	7.8	Nk	4505.9	8.7	Nk
	4493.0	7.9	Nk	4508.6	8.0	Jo
	4494.7	6.6	Mb	4516.5	7.7	Pt
	4494.7	7.5	Wb	4519.6	8.6	Jo
	4495.0	8.1	Nk	4522.6	8.8	Jo
	4497.0	8.0	Nk	4523.5	8.5	Gb
	4497.9	8.1	Nk	4523.6	9.0	Bx
	4498.0	7.5	Ch	4530.5	9.5	Cy
	4499.9	8.5	Nk	4534.6	9.1	Mb
	4500.9	8.3	Nk			
193509 RV AQUILAE—						
	4516.5	10.4	Pt			
193972 T PAVONIS—						
	4458.3	13.0	Sm	4494.4	9.4	Sm
	4460.0	12.9	Bl	4495.3	10.1	Ht
	4461.2	12.7	Ht	4499.3	9.7	Ht
	4468.3	12.7	Ht	4500.4	9.1	Sm
	4475.3	12.3	Ht	4502.4	8.9	Sm
	4484.0	11.7	Bl	4506.3	9.2	Ht
	4485.3	11.7	Ht	4507.3	8.9	Sm
	4489.3	11.0	Sm			
194048 RT CYGNI—						
	4482.7	8.9	Wb	4508.6	10.0	Jo
	4488.1	9.3	Ch	4516.5	11.0	Pt
	4490.0	9.2	Ch	4530.5	11.3	Cy
	4498.0	9.8	Ch	4534.6	8.7	Mb
	4503.5	9.0	Cy			
194348 TU CYGNI—						
	4498.0	[11.2	Ch	4516.5	12.6	Pt
194604 X AQUILAE—						
	4516.5	9.3	Pt			
194632 χ CYGNI—						
	4486.9	6.5	Kd	4497.9	6.6	Nk
	4487.9	6.4	Kd	4498.0	6.6	Ch
	4488.1	6.7	Ch	4499.9	6.6	Nk
	4488.9	6.3	Kd	4500.9	6.6	Nk
	4490.9	6.0	Kd	4500.9	6.0	Kd
	4492.9	5.9	Kd	4501.9	6.8	Nk
	4493.9	5.8	Kd	4503.9	6.0	Kd
	4496.3	6.2	Lp	4504.9	6.8	Nk
	4496.9	6.5	Nk	4505.9	6.7	Nk
	4497.0	6.1	Kd	4509.9	5.9	Kd
194929 RR SAGITTARII—						
	4456.9	7.6	Bl	4484.0	9.1	Bl
	4468.0	8.7	Bl			
195142 RU SAGITTARII—						
	4456.9	9.4	Bl	4468.3	10.5	Ht
	4458.3	10.1	Sm	4475.3	10.9	Ht
	4461.3	10.5	Ht	4484.0	11.5	Bl
	4468.0	10.7	Bl			

VARIABLE STAR OBSERVATIONS RECEIVED DURING JANUARY, 1926—Continued.

Star	J.C.D.	Est.	Obs.	J.C.D.	Est.	Obs.
195553 NOVA CYGNI, 1920—						
	4500.0	12.4	Nk	4523.5	12.6	Pt
	4502.0	12.4	Nk	4528.5	12.6	Pt
	4512.5	12.6	Pt	4531.5	12.7	Pt
	4515.5	12.6	Pt	4532.5	12.5	Pt
195849 Z CYGNI—						
	4490.1	9.0	Ch	4499.9	8.5	Nk
	4492.0	9.0	Nk	4500.9	8.5	Nk
	4494.9	8.4	Nk	4501.9	8.4	Nk
	4497.0	8.5	Nk	4505.9	8.0	Nk
	4497.9	8.6	Nk	4516.5	7.5	Pt
195855 S TELESCOPII—						
	4460.0	13.0	Bl			
200212 SY AQUILAE—						
	4487.2	10.5	L	4511.2	8.7	L
	4499.2	9.0	L	4516.5	8.4	Pt
200357 S CYGNI—						
	4502.5	13.9	Bi	4516.5	13.5	Pt
200514 R CAPRICORNI—						
	4493.0	10.0	Ch			
200715a S AQUILAE—						
	4489.1	9.6	Ch	4517.5	9.6	Pt
	4496.3	9.5	Lp			
200715b RW AQUILAE—						
	4517.5	8.0	Pt			
200747 R TELESCOPII—						
	4460.0	[13.5	Bl			
200822 W CAPRICORNI—						
	4460.0	[12.8	Bl			
200938 RS CYGNI—						
	4446.9	9.0	Kk	4498.9	9.6	Kk
	4450.9	9.1	Kk	4492.4	8.4	L
	4453.9	9.0	Kk	4502.1	9.1	Ch
	4470.9	8.9	Kk	4502.2	8.2	L
	4475.8	9.1	Kk	4502.9	9.5	Kk
	4482.7	8.8	Wb	4503.4	9.0	Cy
	4485.0	9.1	Ch	4503.9	9.5	Kk
	4488.1	9.0	Ch	4508.5	8.8	Cy
	4488.9	9.2	Kk	4508.6	7.7	Jo
	4489.1	9.0	Ch	4517.5	8.0	Pt
	4489.9	9.3	Kk	4519.6	8.2	Jo
	4490.1	9.0	Ch	4522.6	8.8	Cy
	4492.8	9.3	Kk	4523.5	8.7	Ly
	4498.0	9.0	Ch	4530.5	8.7	Cy
201008 R DELPHINI—						
	4487.2	12.4	L	4517.5	13.6	Pt
	4499.2	12.3	L			
201121 RT CAPRICORNI—						
	4500.9	7.5	Kd			
201130 SX CYGNI—						
	4503.4	[12.6	Cy	4530.4	[12.6	Cy
	4517.5	13.3	Pt			
201130 RT SAGITTARII—						
	4456.9	12.5	Bl	4468.0	12.7	Bl
201437b WX CYGNI—						
	4485.0	10.3	Ch	4504.5	9.2	B
	4488.1	10.3	Ch	4508.4	10.4	Cy
	4489.1	10.3	Ch	4517.5	9.3	Pt
	4498.0	10.5	Ch	4522.6	10.5	Cy
	4502.5	10.0	Bi	4530.5	9.2	B
	4503.6	10.4	Cy	4530.5	10.7	Cy
201647 U CYGNI—						
	4447.0	8.2	Kk	4501.9	8.6	Nk
	4450.9	8.4	Kk	4502.5	7.8	Bi
	4485.9	8.3	Nk	4505.9	8.6	Nk
	4492.0	8.8	Nk	4508.6	7.6	Jo
	4493.0	8.8	Nk	4511.5	7.7	B
	4495.0	8.7	Nk	4517.5	7.6	Pt
	4497.0	8.9	Nk	4519.6	7.8	Jo
	4498.0	8.9	Nk	4522.6	6.7	Jo
	4498.0	7.7	Ch	4523.5	8.0	Gb
	4499.9	8.8	Nk	4528.5	7.8	Mh
	4500.0	8.7	Nk			
202240 U MICROSCOPII—						
	4456.9	8.7	Bl	4484.0	8.7	Bl
	4468.0	8.7	Bl			
202946 SZ CYGNI—						
	4511.5	8.8	B	4518.5	9.8	Pt
	4512.5	8.9	Pt	4523.5	9.4	Pt
	4514.5	8.9	Pt	4528.5	9.1	Pt
	4515.5	9.2	Pt	4531.5	9.5	Pt
	4516.5	9.6	Pt	4532.5	9.5	Pt
	4517.5	9.7	Pt	4535.5	9.8	Pt
202954 ST CYGNI—						
	4502.5	9.8	Bi	4517.5	10.6	Pt
	4504.5	9.9	B			
203226 V VULPECULAE—						
	4517.5	8.5	Pt			
203420 R MICROSCOPII—						
	4456.9	9.3	Bl	4484.0	10.2	Bl
	4468.0	9.5	Bl			
203611 Y DELPHINI—						
	4504.5	11.6	B	4517.5	11.8	Pt
203816 S DELPHINI—						
	4497.0	10.0	Nk	4501.9	9.6	Nk
	4497.9	10.0	Nk	4505.9	9.0	Nk
	4499.9	9.9	Nk	4511.5	8.8	B
	4500.9	9.7	Nk	4517.5	8.8	Pt
203847 V CYGNI—						
	4488.1	11.0	Ch	4511.5	8.9	B
	4497.1	10.8	Ch	4517.5	8.5	Pt
	4502.5	9.5	Bi			
203905 Y AQUARII—						
	4493.0	11.4	Ch			
204016 T DELPHINI—						
	4492.0	[14.0	Nk	4501.9	[14.0	Nk
204102 V AQUARII—						
	4498.0	8.0	Ch	4516.5	7.6	Pt
204104 W AQUARII—						
	4450.2	[14.0	L	4490.2	14.0	L
204215 U CAPRICORNI—						
	4460.5	[13.6	Bl			
204318 V DELPHINI—						
	4517.4	[12.6	B	4520.5	[12.6	B
204405 T AQUARII—						
	4493.0	[11.5	Ch			
204846 RZ CYGNI—						
	4502.5	13.4	Bi	4517.5	13.2	Pt
204954 S INDI—						
	4460.0	[13.5	Bl			
205017 X DELPHINI—						
	4517.5	12.9	Pt			

VARIABLE STAR OBSERVATIONS RECEIVED DURING JANUARY, 1926—Continued.

Star	J.C.D.	Est.	Obs.	J.C.D.	Est.	Obs.
205923a R VULPECULAE—						
	4489.1	10.8	Ch	4517.4	9.6	Pt
	4510.5	10.4	B			
210124 V CAPRICORNI—						
	4456.9	12.9	Bl			
210129 TW CYGNI—						
	4504.5	11.5	B			
210221 X CAPRICORNI—						
	4460.0	[12.7	Bl			
210382 X CEPHEI—						
	4517.5	11.8	B	4520.5	11.4	B
210504 RS AQUARII—						
	4490.2	13.1	L	4502.2	12.7	L
210812 R EQUULEI—						
	4503.6	12.1	Cy	4517.5	12.7	Pt
210868 T CEPHEI—						
	4447.0	8.8	Kk	4501.9	9.4	Nk
	4450.9	8.6	Kk	4502.1	10.1	Ch
	4454.0	8.9	Kk	4502.2	9.6	L
	4470.0	9.3	Kk	4502.9	9.7	Nk
	4470.9	9.3	Kk	4502.9	9.9	Kk
	4490.1	9.8	Ch	4503.6	9.8	Cy
	4492.4	9.5	L	4508.5	9.7	B
	4492.9	9.5	Kk	4508.6	9.2	Jo
	4494.7	9.8	Wb	4517.5	9.8	Pt
	4495.0	9.9	Nk	4519.6	9.6	Jo
	4495.7	9.6	Mb	4523.5	10.3	Ya
	4497.0	10.3	Nk	4530.6	10.5	Cy
	4498.0	10.0	Nk	4535.5	10.7	Cu
	4498.9	9.9	Kk	4535.5	10.1	Mf
	4499.9	9.5	Nk	4535.6	9.4	Jo
	4500.9	9.5	Nk			
211614 X PEGASI—						
	4503.6	11.5	Cy	4517.5	11.0	Pt
	4504.5	11.8	B			
211615 T CAPRICORNI—						
	4456.9	10.4	Bl	4484.0	11.8	Bl
	4468.0	11.4	Bl	4493.0	[11.1	Ch
212030 S MICROSCOPII—						
	4460.0	12.6	Bl	4489.3	[12.4	Sm
	4462.3	12.8	Sm	4495.3	[12.4	Sm
212814 Y CAPRICORNI—						
	4460.0	[12.9	Bl	4493.1	[10.6	Ch
	4484.0	[12.6	Bl			
213244 W CYGNI—						
	4486.9	6.6	Kd	4500.9	6.5	Kd
	4488.9	6.6	Kd	4503.9	6.6	Kd
	4496.0	6.5	Kd	4509.9	6.5	Kd
213678 S CEPHEI—						
	4491.1	9.5	Ch	4522.4	10.0	Lp
	4517.5	8.9	Pt	4530.6	9.6	Cy
	4520.5	9.6	B			
213753 RU CYGNI—						
	4490.1	9.9	Ch	4503.7	9.6	Cy
	4497.0	9.8	Nk	4505.9	9.8	Nk
	4497.9	10.1	Nk	4517.5	9.3	Pt
	4499.9	10.1	Nk	4522.6	9.4	Cy
	4500.9	10.1	Nk	4523.5	9.8	Ya
	4502.0	9.7	Nk	4530.5	9.6	Cy
	4503.0	9.9	Nk			
213843 SS CYGNI—						
	4485.9	11.9	Nk	4514.5	11.8	Ie
	4486.2	12.2	L	4514.5	11.8	Pt
	4487.2	12.2	L	4515.5	11.8	Pt
	4488.1	11.8	Ch	4516.5	11.8	Pt
	4489.1	11.8	Ch	4516.5	12.0	B
	4489.9	12.0	Nk	4517.4	11.9	B
	4490.1	11.8	Ch	4517.5	11.8	Pt
	4490.2	12.1	L	4518.5	11.8	Pt
	4491.1	11.8	Ch	4520.4	11.9	B
	4491.3	12.2	L	4522.5	11.5	Ya
	4492.0	11.5	Nk	4522.5	11.2	Ie
	4492.1	11.8	Ch	4522.6	11.4	Cy
	4492.4	12.1	L	4523.5	10.3	Pt
	4493.0	12.0	Nk	4523.5	10.6	Cu
	4493.2	12.2	L	4523.5	10.2	Ly
	4494.1	12.0	Ch	4523.5	10.6	Ie
	4494.9	12.0	Nk	4523.5	10.1	Du
	4497.0	11.9	Nk	4523.5	10.5	Ya
	4498.1	11.9	Ch	4523.6	10.6	Bx
	4498.3	11.8	Kl	4524.8	10.1	Cu
	4499.1	11.9	Ch	4525.6	9.1	Du
	4499.2	12.3	L	4526.5	9.1	Cu
	4499.9	11.7	Nk	4526.5	9.0	Ly
	4500.2	12.3	L	4527.2	8.6	Kl
	4500.9	11.7	Nk	4527.5	8.6	Ie
	4501.2	12.2	L	4527.5	9.1	B
	4501.9	11.8	Nk	4528.5	8.4	Cu
	4502.1	11.7	Ch	4530.4	8.3	B
	4502.2	12.3	L	4530.5	8.4	Cu
	4502.5	11.8	Bi	4530.5	8.5	Ie
	4503.0	11.8	Nk	4530.5	8.4	Ya
	4503.2	12.3	L	4531.5	8.5	Pt
	4503.4	11.7	Cy	4531.5	8.3	Cy
	4503.9	11.8	Nk	4532.5	8.2	Cu
	4504.5	11.9	B	4532.5	8.6	Ya
	4505.0	11.8	Nk	4532.5	8.3	Ly
	4506.0	11.7	Nk	4532.5	8.5	Pt
	4506.9	11.7	Nk	4535.5	8.5	Pt
	4508.4	12.0	Cy	4535.5	8.5	Ly
	4508.5	11.9	B	4535.5	8.3	Mf
	4510.5	11.7	B	4535.5	8.7	Ya
	4511.2	12.0	L	4535.5	8.4	Cu
	4511.5	11.7	Ie	4539.4	9.1	Cu
	4512.5	11.8	Pt	4539.5	8.9	Mf
	4513.5	11.7	Ie			
213937 RV CYGNI—						
	4517.5	6.6	Pt			
214024 RR PEGASI—						
	4518.5	12.6	Pt	4521.5	13.1	B
214247 R GRUIS—						
	4456.9	11.8	Bl	4489.3	12.9	Sm
	4458.4	12.0	Sm	4494.3	12.9	Sm
	4461.3	12.0	Ht	4495.3	12.9	Ht
	4468.0	11.8	Bl	4499.3	12.9	Ht
	4468.3	12.0	Ht	4502.3	[12.9	Sm
	4475.3	12.4	Ht	4506.3	12.9	Ht
	4484.0	12.6	Bl			
215605 V PEGASI—						
	4518.5	10.0	Pt			

VARIABLE STAR OBSERVATIONS RECEIVED DURING JANUARY, 1926—Continued.

Star	J.C.D.	Est.	Obs.	J.C.D.	Est.	Obs.
215934 RT PEGASI—						
	4502.6	11.9	Bi	4518.5	12.6	Pt
	4504.5	11.9	B	4520.5	12.9	B
220133a RY PEGASI—						
	4504.5	12.3	B	4521.5	12.2	B
	4518.5	12.0	Pt			
220133b RZ PEGASI—						
	4504.5	12.8	B	4521.5	12.6	B
220412 T PEGASI—						
	4499.1	[11.6	Ch			
220613 Y PEGASI—						
	4502.6	[13.6	Bi	4510.5	[12.8	B
220714 RS PEGASI—						
	4502.6	9.2	Bi	4510.5	9.3	B
221938 T GRUIS—						
	4458.4	9.6	Sm	4500.4	9.8	Sm
	4489.3	9.4	Sm	4506.3	9.9	Sm
	4494.3	9.6	Sm			
221948 S GRUIS—						
	4461.3	12.8	Ht	4495.3	12.2	Ht
	4462.3	12.6	Sm	4499.3	12.0	Ht
	4468.3	12.5	Ht	4502.3	11.4	Sm
	4475.3	12.2	Ht	4506.3	11.7	Ht
	4489.3	12.4	Sm	4507.3	11.1	Sm
	4494.3	12.2	Sm			
222129 RV PEGASI—						
	4504.5	10.9	B			
222439 S LACERTAE—						
	4502.6	12.8	Bi	4521.5	13.3	B
	4518.5	12.6	Pt			
222867 R INDI—						
	4456.9	11.5	Bl	4484.0	8.6	Bl
	4468.0	10.0	Bl			
223462 R TUCANAE—						
	4461.3	9.3	Ht	4485.3	11.1	Ht
	4462.4	9.3	Sm	4495.3	11.8	Ht
	4468.3	9.9	Ht	4499.3	12.0	Ht
	4475.3	10.2	Ht	4506.3	12.8	Ht
223841 R LACERTAE—						
	4499.1	[10.4	Ch	4518.5	13.4	Pt
	4502.6	12.3	Bi			
225914 RW PEGASI—						
	4521.5	[13.4	B			
230110 R PEGASI—						
	4498.2	[11.3	Ch	4518.5	12.8	Pt
230759 V CASSIOPEIAE—						
	4497.0	9.5	Nk	4504.5	9.8	B
	4497.9	9.4	Nk	4505.9	9.5	Nk
	4499.9	9.4	Nk	4517.5	10.2	B
	4500.9	9.5	Nk	4518.5	10.0	Pt
	4501.9	9.4	Nk	4530.5	10.7	B
	4503.0	9.5	Nk	4530.6	11.0	Cy
231425 W PEGASI—						
	4498.2	9.0	Ch	4503.4	9.2	Kl
	4498.3	9.0	Kl	4510.2	9.3	Kl
	4500.2	9.0	Kl	4527.2	9.6	Kl
	4502.6	9.0	Bi			
231508 S PEGASI—						
	4498.2	8.0	Ch	4510.5	8.5	B
	4518.5	8.5	Pt			
232746 V PHOENICIS—						
	4468.3	13.2	Ht	4495.3	[13.2	Ht
	4475.3	[12.7	Ht	4499.3	[13.6	Ht
	4489.4	[12.7	Sm	4503.4	[13.2	Sm
232847 Z ANDROMEDAE—						
	4446.9	9.8	Kk	4498.2	10.0	Ch
	4450.9	9.7	Kk	4518.5	9.9	Pt
233335 ST ANDROMEDAE—						
	4498.2	9.7	Ch	4518.5	10.0	Pt
	4510.5	9.6	B			
233815 R AQUARII—						
	4447.0	10.1	Kk	4518.5	10.0	Pt
	4493.1	10.1	Ch			
233956 Z CASSIOPEIAE—						
	4502.7	10.9	Bi	4522.6	11.2	Cy
	4503.7	10.9	Cy	4530.5	11.0	B
	4504.5	10.6	B	4530.6	11.6	Cy
	4517.5	10.8	B			
235053 RR CASSIOPEIAE—						
	4496.1	[10.2	Ch	4521.5	11.6	B
235209 V CETI—						
	4456.9	8.9	Bl	4484.0	9.6	Bl
	4460.0	8.9	Bl	4491.3	10.1	L
	4468.0	9.5	Bl			
235365 R TUCANAE—						
	4489.4	[13.0	Sm	4503.9	[13.0	Sm
235350 R CASSIOPEIAE—						
	4497.0	12.0	Nk	4503.0	12.2	Nk
	4499.9	12.2	Nk	4505.9	12.2	Nk
	4500.9	12.4	Nk	4521.5	12.2	B
	4502.0	12.3	Nk	4530.6	12.4	Cy
	4502.7	12.1	Bi			
235525 Z PEGASI—						
	4497.0	8.8	Nk	4505.9	9.2	Nk
	4497.9	8.8	Nk	4518.5	9.3	Pt
	4499.9	8.9	Nk	4531.6	9.9	Cy
	4500.9	8.9	Nk	4532.5	9.8	Ie
	4502.0	8.8	Nk			
235855 Y CASSIOPEIAE—						
	4521.5	[13.1	B			
235939 SV ANDROMEDAE—						
	4502.6	9.0	Bi	4509.6	8.1	B
	4509.5	8.0	Pt	4518.5	8.0	Pt

Total observations, 1669; stars observed, 343; total observers, 33.

The following observers have contributed to this report of observations received during the month of January, 1926: Allen, "Al"; Baldwin, "Bl"; Barnes, "Bx"; Berman, "Bi"; Bouton, "B"; Braid-White, "Wb"; Chandra, "Ch"; Cilley, "Cy"; Cunningham, "Cu"; Dunham, "Du"; Gaebler, "Gb"; Goodsell, "Gs";

Houghton, "Ht"; Iedema, "Ie"; Ikeda, "Ik"; Jones, "Jo"; Kanda, "Kd"; Kasai, "Kk"; Kohl, "Kl"; Lacchini, "L"; Leavenworth, "Lv"; Mrs. Leavens, "Ls"; Lepper, "Lp"; Mrs. Lytle, "Ly"; MacPherson, "Mp"; Marshall, "Mh"; Mayall, "Mf"; Murdock, "Mb"; Nakamura, "Nk"; Peltier, "Pt"; Smith, "Sm"; Watson, "Pw"; Yalden, "Ya".

LEON CAMPBELL, Recording Secretary.

February 11, 1926.

COMET NOTES.

Comet 1926 *b* (Blathwayt).—This comet has come quite rapidly north during February and in the latter part of March will be above the horizon night and day. Unfortunately it is rapidly growing fainter so that amateurs may not be able to follow it.

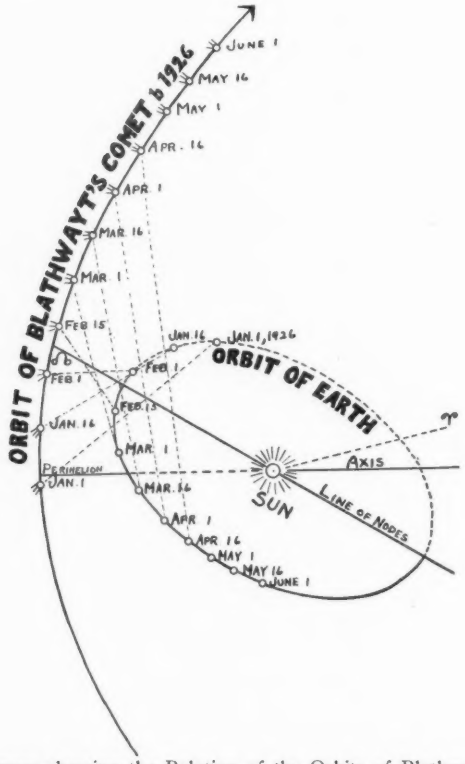


Diagram showing the Relation of the Orbits of Blathwayt's Comet and the Earth. Drawn by Merten Hasse, Student in Astronomy, Carleton College.

The accompanying diagram will show the reason for both the rapid northerly motion and the increasing faintness. On February 17 it could be easily seen with our 5-inch finder, but was very hazy and diffuse, almost round, 3′ or 4′ in diameter; with the 16-inch telescope it had a small nucleus of about magnitude 12.

The diagram was prepared by one of our students in general astronomy from the elements by Maxwell and Storer, published in the *Lick Observatory Bulletin*, No. 373, which are given below. These elements were based on observations on January 16, 20, and 22.

ELEMENTS OF COMET 1926 *b* (BLATHWAYT).

$$\left.\begin{aligned} T &= 1926,\ \text{Jan. } 3.57113\ \text{U. T.} \\ \omega &= 328^\circ\ 54'\ 10''.5 \\ \Omega &= 136\ \ 02\ \ 48.3 \\ i &= 128\ \ 22\ \ 13.5 \end{aligned}\right\} 1926.0$$

$$\log q = 0.129274$$

Professor R. T. Crawford has, at our request, very kindly communicated by air mail an ephemeris (given below) depending upon later observations.

Ephemeris of Comet 1926 *b* (Blathwayt).—I am sending herewith, by air mail, an ephemeris of Blathwayt Comet. It was computed by Messrs. Maxwell and Storer, and is based upon an orbit computed from observations of January 16, 22, and February 9. We are not sending these new elements as there seems to be some doubt about the accuracy of the last observation. Another orbit is being computed, based on a later observation than February 9. This will not be completed in time to reach you by February 22, so I am sending this ephemeris which will be considerably better for finding purposes than that of L. O. Bulletin 373.

EPHEMERIS OF COMET 1926 *b* (BLATHWAYT)
for Greenwich Midnight.

U. T.	True α	True δ	Log Δ	Br.
	h m s	° ′		
Feb. 17.0	7 21 09	+33 15.8	9.785	0.97
21.0	6 48 59	+37 27.7	9.852	
Feb. 25.0	6 23 55	+40 09.0	9.915	0.57
Mar. 1.0	6 04 43	+41 54.8	9.973	
5.0	5 50 09	+43 07.2	0.026	0.28
9.0	5 39 09	+43 59.1	0.073	
13.0	5 30 55	+44 38.5	0.116	0.17
17.0	5 24 50	+45 09.8	0.156	
21.0	5 20 26	+45 36.0	0.191	0.11
25.0	5 17 22	+45 59.0	0.224	
Mar. 29.0	5 15 23	+46 19.9	0.253	0.08

R. T. CRAWFORD, Acting Director.

University of California, Berkeley Astronomical Department,
(Students' Observatory), February 19, 1926.

Comet 1925 *j* (Van Biesbroeck).—This comet is still quite bright and has a short tail. It is almost directly south of Regulus and moving westward (See diagram p. 75, January issue of POPULAR ASTRONOMY).

Comet 1925 *l* (Ensor).—The accompanying diagram shows the relation of the orbit of Ensor's comet to that of the earth. It was first seen when far below the plane of the earth's path and during this month and next will be far above

and visible in the region of sky not far from the north pole. It may be a brilliant object about the first of March, when it will be a morning object toward the northeast. During the latter half of March and in April it will be circumpolar, and so may be seen at any hour of the night, but will become rapidly fainter because of its increasing distance.

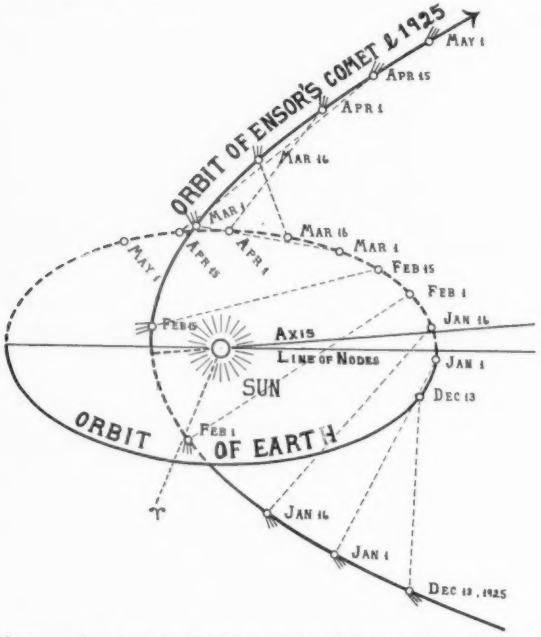


Diagram showing the Relation of the Orbits of Ensor's Comet and the Earth. Drawn by Homer B. Wellman, Student in Astronomy, Carleton College.

The following elements and ephemeris have been calculated by Mr. F. E. Seagrave:

ELEMENTS OF COMET ENSOR, 1925 *l*.

T = 1926 Feb. 12.791
π = 275° 58′ 57″
Ω = 282 14 40
i = 122 46 16
log q = 9.52498

EPHEMERIS OF COMET ENSOR, 1925 *l*.

1926 U. T.		α h m s	δ ° ′ ″	Log r	Log Δ
March	15	21 31 25	+43 53 21	9.93660	9.94987
	23	22 22 1	+61 6 16	0.01080	9.97602
	31	0 8 48	+73 3 35	0.07180	0.02974
April	8	3 8 46	+76 31 21	0.12338	0.09419
	16	5 21 14	+73 17 59	0.16790	0.15874
	24	6 26 29	+68 43 35	0.20702	0.21892

The above parabolic elements of Comet Ensor (1925 *l*) are based upon three

positions, the intervals between them being very small, only two days. They are only approximate, as the arc is so short. The ephemeris is based upon these elements and is of course only approximate. The comet will be circumpolar during the latter part of March and most of April.

FRANK E. SEAGRAVE.

Boston, January 29, 1926.

COMMUNICATIONS.

Credit to Dartmouth for Professor Charles A. Young's Work.— In some reading which I have recently undertaken along the line of Astro-Physics, I came across S. A. Mitchell's article in POPULAR ASTRONOMY, Vol 31, Dec. 1923, page 652. The article istelf is a wonderfully clear presentation of a highly technical subject, yet so written that the layman may grasp its essentials. I was, however, sorry to note that while Prof. C. A. Young was given full credit for his bold prediction of a "reversal" of spectroscopic dark-lines at the moment of totality in a solar eclipse and also for his verification of that prediction during the eclipse of 1870, yet the institution credited with this epoch-making prediction and verification was Princeton instead of Dartmouth College.

In the interest of accuracy and that my own state and college may receive their just due, I write to say that until 1877 Prof. Charles A. Young was a member of the Dartmouth faculty and that his researches with the little 10-inch telescope at Shattuck Observatory made him one of the pioneers in astronomical observation and theory. His prediction that there must be a reversal of "dark-lines" to "bright-lines" was as truly a triumph of deductive reasoning as was that of Adams and Leverrier in foretelling the existence of and place of Neptune.

We of New Hampshire are justly proud of our two illustrious astronomers, Prof. C. A. Young and Dr. E. B. Frost.

G. H. WHITCHER.

Concord, New Hampshire.

Seeing Stars by Daylight, and Agricultural Astronomy.— On page 145 of the February issue of POPULAR ASTRONOMY, under the caption "Seeing Stars by Daylight," the following clipping from the Birmingham, Alabama, News is printed.

"I have read that Professor Charles Clayton Wylie . . . declares that seeing stars by daylight is a myth. . . . However, if he will come to my home I can convince him of his error. . . . Many of our farmers in Marion County have the habit of descending to the bottom of their 70-foot silos in the daytime and looking at the stars. . . . I myself have plainly seen Ursa Major, Algol, and Capella in the early afternoon of a September day."

The clipping is an abbreviation of an item sent out last July, presumably by some Indianapolis feature writer. As I first saw it, the date and hour was given for each of the supposed observations. It was sent to POPULAR ASTRONOMY by Professor R. H. Baker of the University of Illinois with the comment, "Perhaps some one will be interested enough to try this experiment in agricultural astronomy next September."

As a boy on a dairy farm, I was in many silos, and as the agricultural astronomer's method of demonstrating stars by daylight is interesting, to say the least,

I will give it briefly. The man the farm hands are leading on has some difficulty seeing the stars as advertised, and is told his eyes should be protected from stray light, as a photographer setting a camera protects his. If he is credulous enough, he will soon be lying on his back, his head wrapped in a coat and looking up through a sleeve, or in some equally helpless position. When he is nicely ready to look for the stars a bucket of cold water is poured down the sleeve on his face.

For the benefit of any who may be disposed to take the item seriously I will add that at the date and hour of the supposed daylight observation of Algol, Algol was below the horizon. At the date and hour of the supposed observation of Capella, Capella was below the horizon. Ursa Major being circumpolar, that constellation was naturally above the horizon at the time reported; but it was about 45 degrees from the zenith, and one doubts whether the Marion County silos lean at that angle.

Since the question has been raised in this magazine, it is probably well to include the following pertinent facts in this note:

1. Men with years of experience in mine work report never having heard of anyone seeing a star by daylight from a mine shaft.

2. The silo, or mine shaft, does not change the contrast between star and sky background. The telescope changes it hundreds of times. From daylight work with a telescope it can be computed that Venus is the only "star" bright enough to be so seen without changing the contrast.

3. Daylight observation of Venus from rooms with high southern windows indicates it must be about thirty times as bright as Vega to be observed by day without optical aid.

4. In the evening, the fixed stars are noticed from a high window of a darkened room, or from a silo, at about the time they can be seen from anywhere out of doors.

As far as I know, no observations have been taken especially to answer this question. We have many facts gathered in connection with other work; but considering the number of educated people ready to believe stories such as this one from Marion County, Indiana, it would seem worth while for some one with access to a high silo, a mine shaft, or a tall chimney, to make a few observations. I would suggest the observation of some bright zenith star, such as Vega, when it is on the meridian in twilight. Record first, the time it is seen over the silo or chimney, and second, whether it can be seen from outdoors immediately after noting the time. Continue until the star is lost in daylight.

C. C. Wylie.

University of Iowa, February 8, 1926.

Church Hears Science.—Dr. E. G. Davis, Kansas City astronomer and scientist, spoke last Sunday night at the Central Congregational church, 13th Street and Central Avenue, Kansas City, Kansas, and showed by chemical analysis that matter while in the atomic state is invisible to the eye and becomes visible only when precipitated.

He said, "The visible universe is a vast inconceivable cosmic precipitate in which chemical changes are constantly taking place in all worlds and suns, constituting an evolution or growth of the elements and their masses similar to the unfolding of the parts of a growing organism."

"All matter," he said, "is in constant evolution or motion."

He cited stars that have disappeared, and new stars that are suddenly appearing, as evidence of the law of physical dissolution and resurrection of worlds. It is expected of the inhabitants of a world to at least keep up with the evolution

of their planet. Denizens of the earth are behind in the "coming forward" of their globe, for more than one-third of the continental earth is already lost to habitation.

Dr. Davis showed photographs of world conditions visible on the earth, moon, Mars and other worlds to substantiate his statements and declared all matter is capable of resurrection. "Many astronomers," he said, "believed our whole solar system and all the life that is, and ever has been upon it, is a resurrection from a dissolution that occurred to certain astronomical bodies millions of years ago. Many of the elements of matter bear evidence of having been used before. Evidences of millions of years of progress and use is stamped upon them.

"The Novae," the speaker continued, "new stars that appear, are examples of the resurrection of worlds, that now after millions of years of oblivion, are visible from the earth." He drew from these facts that the intelligent cosmic energy that resurrected these worlds is continuous and that the energy has not been rendered ineffective by previous physical dissolutions, but underlies the present visible universe, which will therefore evolve forever into a "new heavens and a new earth."

Dr. Davis is president of the Kansas City Astronomical Society and he is a Foundation Member of the Astronomical Society of France.

FLORENCE N. KISER, *Secretary.*

Kansas City, Kansas, January 24, 1926.

Observing the Sunspots. — Observations are being made here at Clark University on the sunspot maximum with a four-inch telescope. Would be glad to get in touch with other observers engaged in the same work.

SAMUEL MARSHALL CRAMER.

49 Arlington St., Worcester, Mass.

The Shadow Bands. —The writer made visual observations of the shadow bands at the eclipse of last January 24, but later put them aside as probably of too little importance to deserve report. Later published accounts make it seem proper to mention certain of the writer's observations.

Chief of these is that the bands were visible during totality with no abrupt change at the terminal instants of the total phase. The bands had been first apprehended some forty seconds before totality and had steadily increased in contrast and definition. When the last rapid drop in illumination told of the arrival of the umbra, (the writer's back was toward the sun) the bands still persisted. This was a matter of surprise, as the expectation was for a lapse of the bands during totality, and the bands were watched for most of the total phase before several seconds were purloined for a glance at the corona, the bands being watched again before the umbra had passed. They were still improving in visibility and seemed to attain their optimum about a half minute after totality. They were last discernible with certainty about 135 seconds after.

The bands were observed on a very clean, trackless snowdrift and on a white frame house nearly facing the sun. They were quite like the bands described by numerous other observers. They moved with a velocity of about 150 cm/sec normal to themselves and nearly normal to the path of the moon's shadow. Their visibility was, of course, greatly enhanced by their motion. The actual variation of illumination was easily less than that due to the irregularities of the snow surface sunlit at an incident angle of about 60 degrees.

Another possible point of interest in these observations appeared in their comparison with others. The writer's station was evidently not a favored one for shadow bands. The location chosen was on the Palisades of the Hudson, 300 feet nearly vertically above the west shore of the river. At this particular point the bands were visible for a shorter time than in three other locations where trained observers were stationed, one about a mile and a half west and the others well apart in the central total zone. What weight can be given to comparison of different persons' estimates of the contrast, or visibility, of the bands is of like import,—unfavorable to the writer's station. May the reason lie in the fact that the writer's location was well "up in the air" for the rays from the morning sun?

In this same connection it may be remarked that the hope that a location near the boundary of the zone of totality would be more favorable than a central one was not realized. This preference was based on the notion that the bands exist only in a very narrow innermost zone of the penumbra. If they occur within the umbra it vanishes.

While the principal point of this note,—the observation of the bands during totality,—is not new* one may judge from published report that the observation needs confirmation. Unfortunately for this point every other observer of the writer's acquaintance had planned to observe the sun during totality. The point seems relevant to the possibility of accounting for the bands' appearance simply in light from a source angularly smaller than the whole sun's disk. For the bands of the inner penumbra this explanation would suffice, but for those during totality it seems not.

MAX PETERSEN.

Washington Square College, December 12, 1925.

GENERAL NOTES

New Observatory for the University of Texas.—Mr. W. J. McDonald of Paris, Texas, recently deceased, has bequeathed to the University of Texas for the establishment of an astronomical observatory a sum estimated at more than a million dollars. Mr. McDonald was 82 at the time of his death and had been for many years a prominent business man and respected citizen of North Texas. His bequest became known only after the submission of his will for probate.

Professor H. Y. Benedict, Dean of the College of Arts and Sciences, and Professor of Applied Mathematics and Astronomy in the University of Texas, in sending us the above note on February 17, says: "This large bequest came to us like lightning out of a blue sky. We shall make every effort to use this bequest to the maximum advantage of astronomical knowledge. Further details are not available, as we have not as yet a complete copy of the will."

All lovers of Astronomy will congratulate Professor Benedict and the University of Texas on the receipt of this splendid bequest and the opportunity which it affords for furthering the advancement of the science.

*Mrs. Oliver J. Lee has kindly called attention to a memorandum in POPULAR ASTRONOMY, Vol. 13, p. 414; 1905: "In a Circular sent out by A. Lawrence Rotch (Blue Hill Obsy., Readville, Mass.).....attention is called to the fact that some have claimed to see them (shadow bands) during the time of the total phase of the eclipse."

Dr. Miller Receives $1,000 American Association Prize.—The award of the $1000 prize of the American Association for the Advancement of Science to Dr. Dayton C. Miller, Case School of Applied Sciences, Cleveland, is a recognition of patience, perseverance and service to science as well as an acknowledgment that the results of Dr. Miller's work may require serious changes in the prevalent idea of the way the universe is put togther.

The observations made in the course of the ether drift experiments during 1925 consisted of over 100,000 separate readings, a procedure that required Dr. Miller to walk, in the dark, in a small circle, for a total distance of 100 miles, while making at very frequent intervals the most delicate measurements possible.

Dr. Miller said in his prize paper: "I think I am not egotistical, but am merely stating a fact when it is remarked that the ether drift observations are the most trying and fatiguing, as regards physical, mental and nervous strain, of any scientific work with which I am acquainted."

That the results reported in the paper, which the judges decided was the most notable contribution among the thousand papers of the Kansas City meeting, will have a far-reaching effect on the foundations of physics and astronomy can not be doubted. Dr. Miller repeated the experiment that is fundamental to the Einstein theory and found that the accepted interpretation of the famous Michelson-Morley experiment of 1887 must be reversed. There is an ether drift, the earth does carry along with it through space some of the ether, whereas the Einstein theory was built upon the assumption and the results of the 1887 experiment that showed no such drift.

Either the Einstein theory must be modified to meet the new facts, or if such modification is impossible, it must be scrapped. When Dr. Miller announced preliminary results at the April meeting of the National Academy of Sciences, Einstein acknowledged that the data if confirmed would be a serious blow to his theory in its present mathematical formulation. Physicists do not believe, however, that results of Dr. Miller are impossible of reconciliation with a theory of relativity that is worked out upon new assumptions and facts.

That the earth and the solar system are speeding through space at the rate of 125 miles a second or more, ten times the speed previously suspected, was also revealed by Dr. Miller's experiments. Prof. F. R. Moulton of Chicago during the meeting explained that this high velocity may mean in part that our own stellar galaxy or universe is rushing through the ether. If so, the astronomers may be revising some of their ideas of the composition of the universe.

Dr. Miller began his experiments on ether drift thirty years ago. Soon he will again journey to Mount Wilson to repeat the experiments once more. Such is the method of science; the rewards are an inspiration to mankind.—(Science News Letter, January 23, 1926.)

Harvard Observatory Expedition to Chile.—During November two telescopes were transferred from the Harvard station at Arequipa, Peru, to Chuquicamata in northern Chile, in order that photometric and spectroscopic work on faint stars could be continued without much interruption during the season, from November into March, when cloudy conditions prevail at Arequipa. The station at Chuquicamata, which was occupied two years ago for the first time, is at an altitude of more than nine thousand feet, and the percentage of clear nights appears to be greater than for any other existing observatory. The telescopes in use at Chuquicamata are the 10-inch Metcalf triplet, which is employed in the study of faint Milky Way variables and in obtaining spectrum plates for the Henry Draper Extension, and a 3-inch Ross-Tessar lens which is employed

mainly for the systematic patrol of the southern sky. The station is about twenty-five miles from the Smithsonian Astrophysical Observatory at Montezuma.

The work at Chuquicamata is in charge of Dr. J. S. Paraskévopoulos, superintendent of the Boyden Station of the Harvard Observatory. The expedition was made possible through a gift from Mr. George R. Agassiz. The work at Arequipa is carried on by Mrs. Paraskévopoulos and two assistants.

Harvard College Observatory Bulletin 831,
Cambridge, Massachusetts, January 16, 1926.

Occultation of Aldebaran, July 10, 1923. — The following daylight occultations of Aldebaran, observed by the writer at the University of Illinois Observatory, has never been published. The observation was made using the 12-inch telescope and taking the time on two stop watches which were promptly compared with the Riefler clock. The correction to the Riefler was determined from the Annapolis wireless signals. Conditions were fairly good except that the emersion was lost in a thin cloud.

The observed Greenwich civil time of immersion was 1923, July 10, $18^h\,21^m\,37^s.1$. The observation was perhaps late ± 0.2 seconds.

C. C. Wylie.

University of Iowa, February 4, 1926.

A New Large Telescope for Russia. — The following information is given in a letter to "Science Service" from A. Ivanoff, the director of the Russian Astronomical Observatory at Pulkovo, dated January 2, 1926. A translation of the letter has been very kindly furnished us by Mr. James Stokley.

"The photographic refractor, of which you inquired, was ordered for the Main Russian Astronomical Observatory in Pulkovo, and was intended for installation in one of its branches in the south of Russia.

"The order was made by the Russian Government back in 1912 to the firm of Grubb & Son, in Dublin, but its execution was delayed by the circumstances of the war and by the following events in Russia. In 1922 the order was renewed by the Soviet Government. According to the original plan this instrument was to have a photographic objective 32 inches in diameter with a focal length of 35 feet. Mechanical parts of the mounting, as well as the dome and the rising floor of the observatory, were completed by the Grubb firm before its liquidation. But the attempts to find the necessary discs for the objective lens met with considerable difficulties. The Parsons firm of Newcastle undertook the task of manufacturing such discs and finally succeeded in preparing an objective of 41 inches in diameter. Accordingly the original plan was changed, and it was decided to build a refractor with a photographic objective of 41 inches aperture, leaving the focal length unchanged, i. e., 35 feet.

"Contract for polishing and manufacturing the objective was concluded with the same firm of Parsons, and the time for its completion was set at 3 years.

"According to the plans of construction, the objective was to be composed of two lenses (crown and flint) and achromatic for waves of 4500.

"Nikolaieff (near Odessa) was the place where the refractor was originally to be installed, but it is possible that it will be installed in Simeis (on the southern coast of Crimea, 60 km east of Sevastopol). The dome and rising floor have already been brought to Simeis, while the mounting of the refractor has been kept in England for testing of the objective. The Simeis branch of the Pulkovo Observatory is noted for its excellent atmospheric conditions and at the present time

the installation of a large reflector of 40 inches aperture is almost completed there."

Large Sunspots Indicate Great Solar Activity.— The large sunspot observed by many astronomers, both amateur and professional, during January, and visible even to the unaided eye through smoked glass, disappeared on January 31, when the sun's rotation carried it around the western edge. There is good reason for supposing that it will be seen again, however. Since the time it was first seen last November, this large spot has crossed the solar disc three times. Large spots usually survive for several months and sometimes as long as a year, Dr. Frederick Slocum, professor of astronomy at Wesleyan University, told a representative of *Science Service*.

Prof. Slocum has been studying the sun and its activities at the Van Vleck Observatory of Wesleyan University since 1914, when he became director, and before that he made a specialty of solar studies at the Yerkes Observatory of the University of Chicago.

As the sun rotates on its axis once in about 25 to 32 days, a spot is carried across the disc from east to west, but the rotation is not uniform for all parts of the sun. Spots on the solar equator cross the disc most rapidly, indicating that for that part of the sun the rotation period is about 25 days, while near the poles of the sun the rotation is much slower.

"The large spot recently visible on the sun crossed the central meridian when it was nearest the center of the disc, as seen from the earth, on December 1, December 28, and January 24," said Prof. Slocum. "It was on the eastern edge of the sun on January 17, and having crossed the disc, it passed around the west edge on January 31. This spot is in latitude 22 degrees north on the sun, and the group is 150,000 miles long; the umbra, or dark center, of the main spot being 20,000 miles in diameter, easily visible to the naked eye with smoked glass. Large spots usually last two or three months and occasionally over a year, but smaller spots may last only a few days."

Prominences, the red flames of hydrogen, which shoot out from the sun and are seen at the time of total eclipse of the sun, and at other times with the proper instruments, are related to the spots. When a spot is on the edge, the prominence is seen above it, but Prof. Slocum does not believe that the large spot is related to the prominences observed by the Swarthmore College expedition to Sumatra during the eclipse on January 14. There was, however, a smaller group of spots in 20 degrees south latitude at the edge of the sun on January 14, and these may have caused some of the eclipse prominences.

"The last sunspot maximum occurred in July, 1917," said Prof. Slocum, "so if the period is the normal eleven years, the next should occur in 1928. Recent sunspot activity, however, indicates that there will be either an earlier maximum or one of greater intensity than usual."—Science News Letter, Feb. 13, 1926.)

Metric Systems of Weights and Measures.— On December 7, 1925, a bill was introduced into the House of Representatives of the United States, proposing the extension of the metric system so that it would be the uniform and standard system of weights and measures in all kinds of merchandising transactions. The bill designates January 1, 1935, as the date when the present system shall be generally replaced by the new system. The metric system is in use in our coinage system, and, in general, in scientific work. When one considers the simplicity of the metric system, as compared with the clumsy and unscientific

systems now in use, one is surprised that the change here proposed has not been made long ago. The words associated with the system are not so familiar as those which have been transmitted to us from earlier generations. Meter, gram, liter, sound strange to ears accustomed to yard, pound, quart. To overcome this the bill provides for the new names "world yard," "world pound," and "world quart," for the metric names. The relations between them are much simpler, and children, learning them in the schools, could master them with much less effort than is now expended upon the various tables of weights and measures.

Because of the international character of science, the metric system has been adopted as its universal language. Commerce and merchandising have now also become international to a large extent, and for this reason, as in the case of science, the metric system should become universal in this field also. Many countries are now using it and the adoption of the system by the people of the United States would be an important step in making the system universal. By beginning now the transition would come so easily that in nine years the new system would be in vogue without any abrupt change and without our realizing that the change had been made.

Ball's Popular Guide to the Heavens, fourth edition, completely revised and edited by the Rev. T. E. R. Phillips, Sec., R. A. S. Published by George Philip and Son, Ltd., London. 15s. net; postage 9d. extra.

The first edition of this book appeared in 1892, the second in 1905, and the third in 1910. In the last 15 years the progress of astronomy has been so extremely rapid that much of the book had to be re-written and the plates replaced by new ones. Half of the book consists of 83 plates printed on very heavy plate paper.

The photographs of various typical objects are excellently reproduced. Among them we notice three of the moon by Ritchey, several of comets by Barnard and others, the Orion and Andromeda nebulae by Ritchey, and the Hercules star cluster and the Ring nebula by Plaskett.

The star maps are well printed with black stars on a blue background, easy to use by lamplight.

Those who have used former editions of the book will welcome the new edition.

The North American Almanac, for 1926, is a book of 142 pages covering a wide field of useful and interesting information. It contains the usual astronomical data, found in almanacs, prepared for this one by capable and recognized astronomers. It contains brief sketches of twelve American poets illustrated with a photograph in each case. It contains copies of five documents referred to as "The Five Gospels of Americanism." They are: The Mayflower Compact, The Declaration of Independence, The Constitution of the United States, Washington's Farewell Address, Lincoln's Gettysburg Address. For these alone the book is worth many times what it costs. It contains other articles such as Gleanings in Science, Measuring the Depths of the Ocean, Wonders of Nature, which make exceedingly interesting reading.

This issue maintains the standard of its predecessors and further justifies its claim of being "The Aristocrat of Almanacs." It is published by The North American Almanac Co., Chicago, Illinois, and may be purchased for fifty cents a copy.